EPA/ROD/R10-99/039
1999

EPA Superfund
Record of Decision:

HANFORD 200-AREA (USDOE) and HANFORD 100-AREA (USDOE)
EPA ID: WA1890090078 and WA3890090076
OU(s) 15 & 27
BENTON COUNTY, WA
07/15/1999

INTERIM ACTION RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

U.S. Department of Energy Hanford 100 Area and 200 Area
EPA ID # WA38900900076 and WA1890090078
100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 10-KR-1, 100-KR-2, I00-IU-2, 100-IU-6, and 200-CW-3 Operable Units
Hanford Site
Benton County, Washington

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial actions for portions of the U.S. Department of Energy (DOE) Hanford 100 Area (100 Area Remaining Sites) 100 Area reactor waste and portions of the 200 Area, Hanford Site, Benton County, Washington, which were chosen in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act of 1986,* and to the extent practicable, the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). This decision is based on the Administrative Record for this site and for the specific operable units.

The State of Washington concurs with the selected remedy.

ASSESSMENT OF THE SITES

Actual or threatened releases of hazardous substances from the waste sites and reactor buildings, if not addressed by implementing the response actions selected in this Interim Action Record of Decision (ROD), may present an imminent and substantial endangerment to the public health, welfare, or the environment.

INTEGRATION OF CERCLA AND RCRA REQUIREMENTS

The DOE, the Washington State Department of Ecology (Ecology), and the U.S. Environmental
Protection Agency (EPA) (referred to as the Tri-Parties) recognize the similarities between *Resource Conservation and Recovery Act of 1976* (RCRA) corrective action and CERCLA remedial action processes and their common objective of protecting human health and the environment from potential releases of hazardous substances, wastes, or constituents. As such, the Tri-Parties are electing to combine response actions under RCRA corrective action and CERCLA remedial action.

The RCRA corrective action authorities have clear jurisdiction over waste with chemical constituents (in particular, hazardous waste and hazardous constituents), and mixed wastes (i.e., mixtures of hazardous waste and radiological contaminants), but not over waste with radiological contaminants only. The CERCLA authorities provide jurisdiction over hazardous substances, including radiological contaminants. The Tri-Parties agreed in the *Hanford Federal Facility Agreement and Consent Order* (referred to as the Tri-Party Agreement) that they intend for all remedial and corrective actions conducted under the Tri-Party Agreement to address all aspects of contamination so no further action will be required under Federal and state law. In particular, the Tri-Parties agreed that any units managed under RCRA corrective action shall address all CERCLA hazardous substances for the purposes of corrective action. Therefore, actions taken to remediate these operable units will comply with the provisions of both CERCLA and RCRA. For example, to meet applicable or relevant and appropriate requirements and be protective, the proposed actions are to achieve the soil cleanup standards of the *Model Toxics Control Act* (MTCA) Method B values for chemical contaminants. In addition, the cleanups will achieve 15 millirem/year (mrem/yr) above natural background for radionuclides, as identified in EPA guidance, at all 100 Area sites and 200-CW-3 Operable Unit waste sites. By applying CERCLA authority jointly with that of RCRA, additional options for disposal of corrective action and remedial action wastes at the Environmental Restoration Disposal Facility (ERDF) are possible.

It is the intent of the Tri-Parties to select the same remedy for sites requiring RCRA corrective action as selected for those sites requiring CERCLA interim remedial actions. It is anticipated that the Hanford Facility RCRA Permit will be modified to include the RCRA corrective action sites pursuant to a Class 3 permit modification, as specified in *Washington Administrative Code* (WAC) 173-303-830. At that time, the public will have the opportunity to comment on the Permit conditions relevant to these actions in accordance with the Tri-Party Agreement and applicable state and Federal regulations.

DESCRIPTION OF THE SELECTED REMEDY

This Interim Action ROD includes three types of sites. The first type of sites are identified in Table A-1 and consist of contaminated soils, structures, and debris where sufficient information exists and indicates that remediation is needed to protect human health and the environment. The second type of sites are identified in Table A-2 and consist of contaminated soil, structures, and debris where sufficient information does not exist to determine if remediation is needed to protect human health and the environment. The third group of sites consists of hazardous and radioactively contaminated equipment and debris from the 105-B, 105-D, 105-KE, 105-KW, and 105-H Reactor buildings.

Components of the selected remedy (known Remove/Treat Dispose) for the forty-six 100 Area sites listed in Table A- include the following:

- Remove contaminated soil, structures, and associated debris
- Treat these wastes as required to meet ERDF requirements
- Dispose of contaminated materials at the Hanford Site's ERDF

C Backfill excavated areas with clean material and revegetate the areas.

In addition to the selected alternative for 46 waste sites identified in Table A-1, the use of the "plug-in approach" for remedy selection at more than 161 other 100 Area sites and sites within the 200-CW-3 Operable Unit (identified in Table A-2) will be implemented. The sites contained in Table A-2 are candidates for remediation using the Remove/Treat/Dispose alternative; however, further sampling is required to determine if there is a need for remedial action. Because these sites are similar to the 46 sites being proposed for the Remove/Treat/Dispose alternative, they will "plug-in" to this same remedy if a remedial action is warranted.

Any newly discovered 100 Area sites requiring remedial action that are identified after remedy selection and that are similar to the 100 Area Remaining Sites will also be "plugged-in" to the Remove/Treat/Dispose remedy. The Tri-Parties will notify the public regarding the decision to plug-in newly discovered waste sites through the periodic publication of Explanations of Significant Differences.

This ROD also identifies the selected alternative for disposal of hazardous and radioactive equipment and debris from the 105-B, 105-D, 105-H, 105-KE, and 105-KW Reactor buildings at the ERDF. The alternative for disposal of reactor building waste is consistent with previous CERCLA disposal decisions for the 100-C, 100-F, and 100-DR Reactor areas.

This Interim Action ROD also provides a decision firamework to evaluate leaving some contamination in place at a limited number of sites, specifically where contamination is located at depths greater than 4.6 m (15 ft). The decision to leave contaminated wastes in place at such sites will be a site-specific determination made during remedial design and remedial action activities that will balance the extent of remediation with protection of human health and the environment, disturbance of ecological and cultural resources, worker health and safety, remediation costs, operation and maintenance costs, and radioactive decay of short-lived radionuclides (half life less than 30.2 years [e.g., cesium-137]) radionuclides. The application of the criteria for the balancing factors and the process for determining the extent of remediation at deep sites will be made by EPA and Ecology. Any decision to leave waste in place will occur after the public has been asked to comment on the proposal to leave waste in place.

STATUTORY DETERMINATIONS

The selected remedy specified for this interim action is protective of human health and the environment; complies with Federal and state requirements that are legally applicable, or are relevant and appropriate, for this interim action; and is cost effective.

Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and, thus, is in furtherance of that statutory mandate.

Because this remedy may result in hazardous substances remaining onsite above levels that allow for unlimited use, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after the commencement of the remedial action. This is an Interim Action ROD, therefore, review of this site and this remedy will be ongoing as the Tri-Parties continue to develop final remedial measures for the 100 Area National Priorities List site.

The preamble to the NCP states EPA's interpretation that when noncontiguous facilities are reasonably close to one another and the wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the 100 Area and 200 Area sites addressed bv this Interim Action ROD and ERDF are reasonably close to one another and are considered to be a single site for response purposes.

Signature sheet for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units interim remedial actions between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Keith Klein
Manager, Richland Operations
U.S. Department of Energy

7/13/99
Date

Signature sheet for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units interim remedial actions between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Chuck Clarke

Chuck Clarke
Regional Administrator, Region 10
U.S. Environmental Protection Agency

7/11/95
Date

Signature sheet for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR- 1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Unit interim remedial actions between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Jay Turner for Mike Wilson

Michael Wilson
Program Manager, Nuclear Waste Program
Washington State Department of Ecology

7-15-99
Date

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I. DECISION SUMMARY

The U.S. Department of Energy's (DOE's) Hanford Site was listed on the National Priorities List (NPL) in November 1989 under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) as amended by the *Superfund Amendments and Reauthorization Act of 1986* (SARA). The Hanford Site was divided and listed as four NPL Sites: the 100 Area, the 200 Area, the 300 Area, and the 1100 Area.

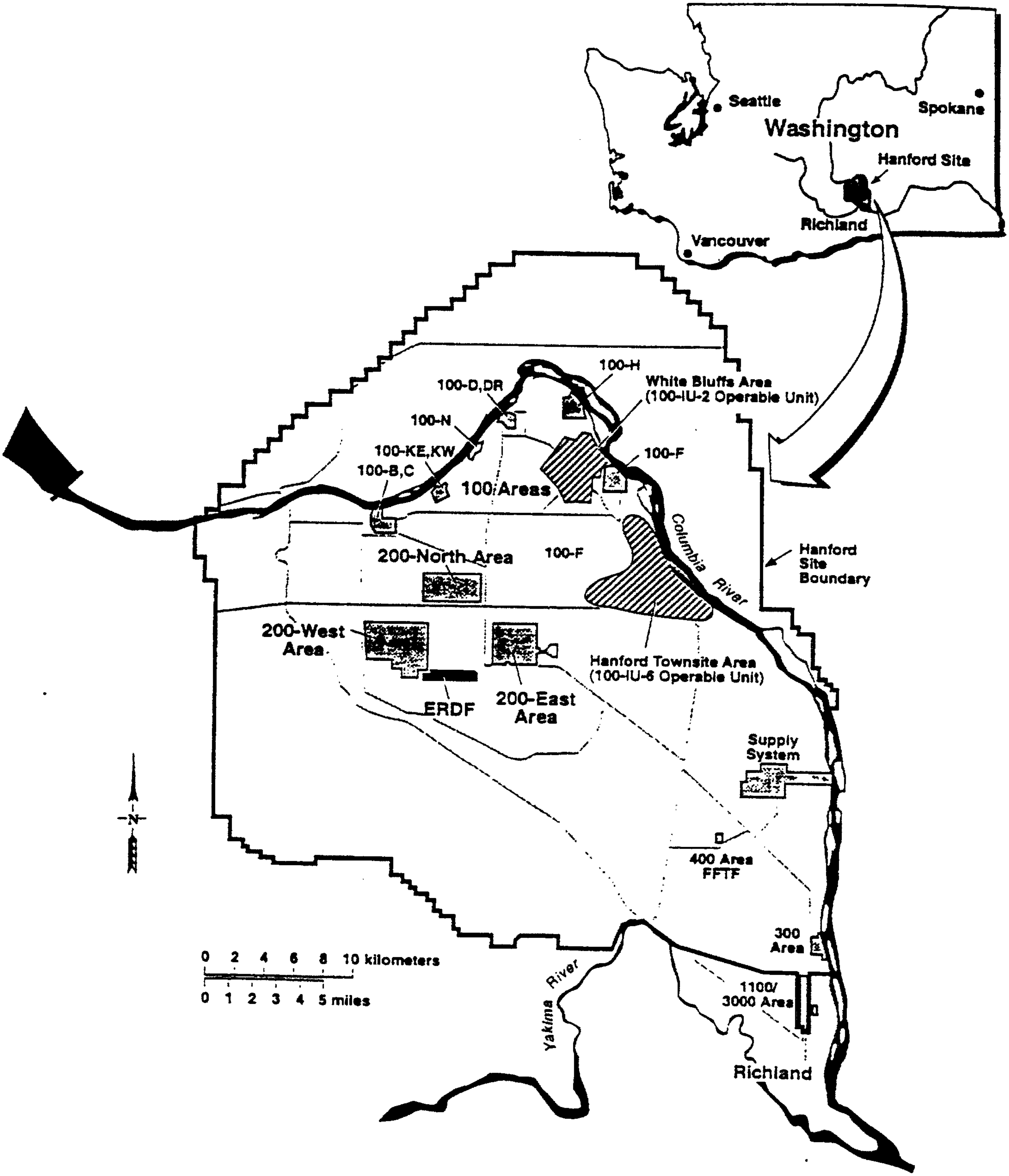
The DOE performed a 100 Area-wide Phase 1 and 2 feasibility study and operable unit (OU) specific limited field investigations (LFI's) for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR- 1, 100-FR-2, 100-HR- 1, 100-HR-2, 100-KR- 1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 OU's that characterized the nature and extent of contamination in soils, structures, and debris that received radioactive liquid effluent discharges. Qualitative risk assessments, comprised of human health risk assessments and ecological risk assessments, were also conducted to evaluate current and potential effects of contaminants on human health and the environment. A 100 Area-wide Phase 3 source waste site feasibility study and 100 Area OU-specific focused feasibility studies also were conducted to evaluate specific waste site remedial action goals, remedial action objectives (RAOs), and technologies.

II. SITE NAME, LOCATION, AND DESCRIPTION

The Hanford Site is a 1,450 km^2 (560 mi^2) Federal facility located along the Columbia River in Benton County in southeastern Washington State. The Site is situated north and west of the cities of Richland, Kennewick, and Pasco, an area commonly referred to as the Tri-Cities (Figure 1). Land use in the areas surrounding the Hanford Site includes urban and industrial development, irrigated and dry-land farming, grazing, and designated wildlife refuges. The region includes the incorporated cities of Richland, Pasco, and-Kennewick (Tri-Cities) and surrounding communities in Benton, Franklin, and Grant counties. Industries in the Tri-Cities are mostly related to agriculture and electric power generation. Wheat, corn, alfalfa, hay, barley, and grapes are the major crops in Benton, Franklin, and Grant counties.

The 100 Area, which encompasses approximately 68 km^2 (26 mi^2) bordering the south shore of the Columbia River, is the site of the nine retired plutonium-production reactors. The waste sites being considered for remediation in this Interim Action Record of Decision (ROD) are in the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR- 1, 100-KR-2, 100-IU-2, 100-1U 6, and 200-CW-3 OUs and contaminated equipment and debris from the 105-B, 105-KW, 105-KE, 105-H, and 105-D Reactor buildings, The 100-IU-2 and 100-IU-6 OUs are former locations of temporary housing and support facilities for the Manhattan Project and include the former town sites of White Bluffs and Hanford. Because of their process history, the DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) (referred to as the Tri-Parties) have determined that the waste sites of the 200-CW-3 waste site group are similar to liquid waste

Figure 1. Map of the Hanford Site Showing the Reactors in the 100 Areas and the Environmental Restoration Disposal Facility.



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disposal sites in the 100 Area and will, therefore, be considered as part of the 100 Area Remaining Sites. These waste sites received cooling water and sludge from 100 Area reactor operations. The remainder of the above operable units include waste sites around the 100 Area production reactors where liquid and solid radioactive wastes and industrial chemicals were disposed to the soil.

100 Area Land Use

Pre-Hanford uses included Native American usage and agriculture. Existing land use in the 100 Area includes facilities support, waste management, and undeveloped land. Facility support activities include operations such as water treatment and maintenance of the reactor buildings. The contaminated waste site land area resulted from former uncontrolled disposal activities in areas now known as "past-practice waste sites." which are located throughout the 100 Area. Lastly, there are undeveloped lands that comprise approximately 90% of the land area within the 100 Area. The undeveloped areas are the least disturbed and contain minimal infrastructure. A 29-km (18-mi) stretch of the Columbia River is located within the 100 Area. The shoreline of the Columbia River is a valued ecological area within the Hanford Site. Portions of the shoreline within the 100 Area are within the 100-year flood plain of the Columbia River. Semi-arid land with a sparse covering of cold desert shrubs and drought-resistant grasses dominates the Hanford Site's landscape. Approximately 40% of the area's annual average rainfall of 6.25 in. occurs between November and January. Wetlands along the Columbia River are contained within the boundaries of the 100 Area NPL site.

In 1992, The Hanford Future Site Uses Working Group recommended that the 100 Area be considered for the following four future land-use options:

- Native American uses
- Limited recreation, recreation-related commercial use, and wildlife use
- 105-B Reactor as a museum and visitor center
- Wildlife and recreational use.

The working group report was submitted to DOE as a formal scoping document for development of DOE's *Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan* (HRA-EIS). A draft of the HPA-EIS, released to the public in August 1996, generated a variety of comments on a number of issues. In response, DOE made significant revisions to the draft document. A revised draft HRA-EIS was made available for public comment on April 23, 1999. This document evaluated five "action alternatives," each of which represented a Federal, state, local agency, or Tribe's preferred land-use alternative. Preferred land-uses for the 100 Area included varying degrees and combinations of preservation, conservation, research and development, and recreation. The public comment period on the revised draft HRA-EIS ended on June 7, 1999. DOE is currently evaluating comments in preparation for issuance of a final land-use determination.

At this time, a final land-use for the 100 Area has not been established. For the purposes of this interim action, the RAOs are for "unrestricted use," consistent with the previous 100 Area soil cleanup decisions. The Tri-Parties may re-evaluate RAOs and cleanup goals selected in this ROD following issuance of the land-use determination.

III. SITE HISTORY AND ENFORCEMENT ACTIONS

The Hanford Site was established during World War II as part of the Manhattan Project to produce plutonium for nuclear weapons. Hanford Site operations began in 1943, and DOE facilities are located throughout the Hanford Site and the city of Richland, Washington. Certain portions of the Hanford Site are known to have cultural and historical significance and may be eligible for listing in the National Register of Historic Places.

In 1988, the Hanford Site was scored using EPA's hazard ranking system. As a result of the scoring, the Hanford Site was added to the NPL in November 1989 as four sites (i.e., the 100 Area, the 200 Area, the 300 Area, and the 1100 Area). Each of these areas was further divided into OUs (a grouping of individual waste units based primarily on geographic area and common waste sources). The 100 Area NPL site consists of the following OUs for contaminated sources such as soils, structures, debris, and burial grounds: 100-BC- 1, 100-BC-2, 100-KR- 1, 100-KR-2, 100-NR-1, 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, 100-FR-1, 100-FR-2, 100-IU-1, 100-IU-2, 100-IU-3, 100-IU-4, 100-IU-5, and 100-IU-6 OUs. For contaminated groundwater the following OUs are included: 100-BC-5, 100-KR-4, 100-NR-2, 100-HR-33, and 100-FR-3. Previous RODs have addressed priority waste sites in the 100 Area. The waste sites being considered for remediation in this ROD are in the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 OUs. Because of their process history, the Tri-Parties have determined that the waste sites of the 200-CW-3 OU waste site group are most closely aligned with liquid waste disposal sites in the 100 Area and will, therefore, be considered as part of the 100 Area Remaining Sites. Also, contaminated equipment and debris from the 105-B, 105-KE, 105-KW, 105-H and 105-D Reactors are being addressed by this Interim Action ROD.

Operable Unit Background

100-B/C Area. The 105-B Reactor, constructed in 1943, operated from 1944 through 1968, when it was retired from service. The 105-C Reactor, constructed in 1951, operated from 1952 until 1969, when it also was retired from service. Currently, the only active facilities in the 100-BC- 1 OU are those that extract and treat water from the Columbia River and transport that water to other 100 Area and 200 Area facilities. The 100-BC-1 and 100-BC-2 OUs, located in 100-B/C Area, include contaminant sources, and the 100-BC-5 OU includes contamination present in the underlying groundwater. The 100-BC-1 OU encompasses approximately 1.8 km^2 (0.7 mi^2) and is located immediately adjacent to the Columbia River shoreline. In general, the OU contains waste units associated with the original plant facilities constructed to support B Reactor operation, as well as the cooling water retention basin systems for both B and C Reactors (see Figure 2).

100-D Area. The 105-DR Reactor operated from 1950 to 1964, when it was retired from service. Currently, sanitary and fire protection water is provided to the 100-H and 100-F Areas from the 100-D Area. The 100-DR-1 and 100-DR-2 are source OU s in the 100-D Area. The 100-HR-3 is the groundwater OU for the 100-D/DR and 100-H Areas. The 100-D/DR Area contains two reactors: the 105-D Reactor associated with the 100-DR-1 OU, and the 105-DR Reactor associated with the 100-DR-2 OU. The D Reactor operated from 1944 to 1967, when it was retired (see Figure 3).

100-H Area. The 105-H Reactor complex was constructed after World War II to produce plutonium for use in military weapons. The H Reactor operated from 1949 to 1965, when it was retired from service. Currently there are no active facilities, operations, or liquid discharges within the 100-HR-1 source OU. The 100-HR-1 and 100-HR-2 source OUs, located in the 100-H Area, include contaminant sources, and the 100-HR-3 groundwater OU includes contamination present in the underlying groundwater. The OU contains waste units associated with the original plant facilities constructed to support the H Reactor. The area also contains evaporation basins that received liquid process wastes and non-routine deposits of chemical wastes from the 300 Area (where fuel elements for the 105-N Reactor were produced). These solar evaporation basins received wastes from 1973 through 1985 and are regulated under the *Resource Conservation and Recovery Act of 1976* (RCRA) as treatment, storage, and disposal facilities (see Figure 4).

100-F Area. The 100-F Area is situated in the north-central part of the Hanford Site along the southern shoreline of the Columbia River, approximately 32 km (20 mi) northwest of the city of Richland, Washington. The 105-F Reactor was constructed from 1943 to 1945 and operated from 1945 to 1965. Most of the facilities associated with the F Reactor, other than the biological research facilities, were also retired in 1965. The 100-FR-1 and 100-FR-2 source OUs, located in the 100-F Area, include contaminant sources, and the 100-FR-3) groundwater OU includes contamination in the underlying groundwater. The OUs contain waste units associated with the original plant facilities constructed to support F Reactor operation, as well as the cooling water retention basin systems for the F Reactor and biological laboratories for studying the effects of radiation on plants and animals (see Figure 5).

100-K Area. The 100-K Area is situated in the north-central part of the Hanford Site along the southern shoreline of the Columbia River, approximately 40 km (25 mi) northwest of the city of Richland, Washington. The 105-KW Reactor operated from 1955 to 1970 and the 105-KE Reactor operated from 1955 to 1971. The 100-KR-1 and 100-KR-2 source OUs, located in the 100-K Area., include contaminant sources, and the 100-KR-4 groundwater OU include contamination in the underlying groundwater. Currently, there are several active facilities within the 100-K Area. They include the 105-KE and 105-KW fuel storage basins, which are used to store spent fuel from the N Reactor; the alum tanks adjacent to Building 183.1-KE; Building 1706-KE for research and development activities; one pumphouse; one water treatment facility; and septic tanks and leach fields used for disposal of sanitary waste (see Figure 6).

100-IU-2 and 100-IU-6 OUs. The 100-IU-2 and 100-IU-6 OUs are the former locations of temporary housing and support facilities for the Manhattan Project and include the former town sites of White Bluffs and Hanford. Waste sites in these OUs primarily consist of construction debris (see Figure 7 and 8).

200 North Cooling Water Pond. Operations in the 200 North Area were mainly related to irradiated nuclear fuel storage. The purpose of the facilities in this area was to provide a storage site for the fuel while the radioisotope decay processes for many of the short-lived radioisotopes were occurring. The area is located approximately 7 to 12 km (4 to 7.5 mi) south of the 100 Areas and immediately north of the 200 Areas. The 200-CW-3 waste site group includes contaminant sources resulting from the release of cooling water from the fuel storage basins (see Figure 9).

Figure 2. 100 Area Remaining Sites in the 100-BC-1 and 100-BC-2 Operable Units.

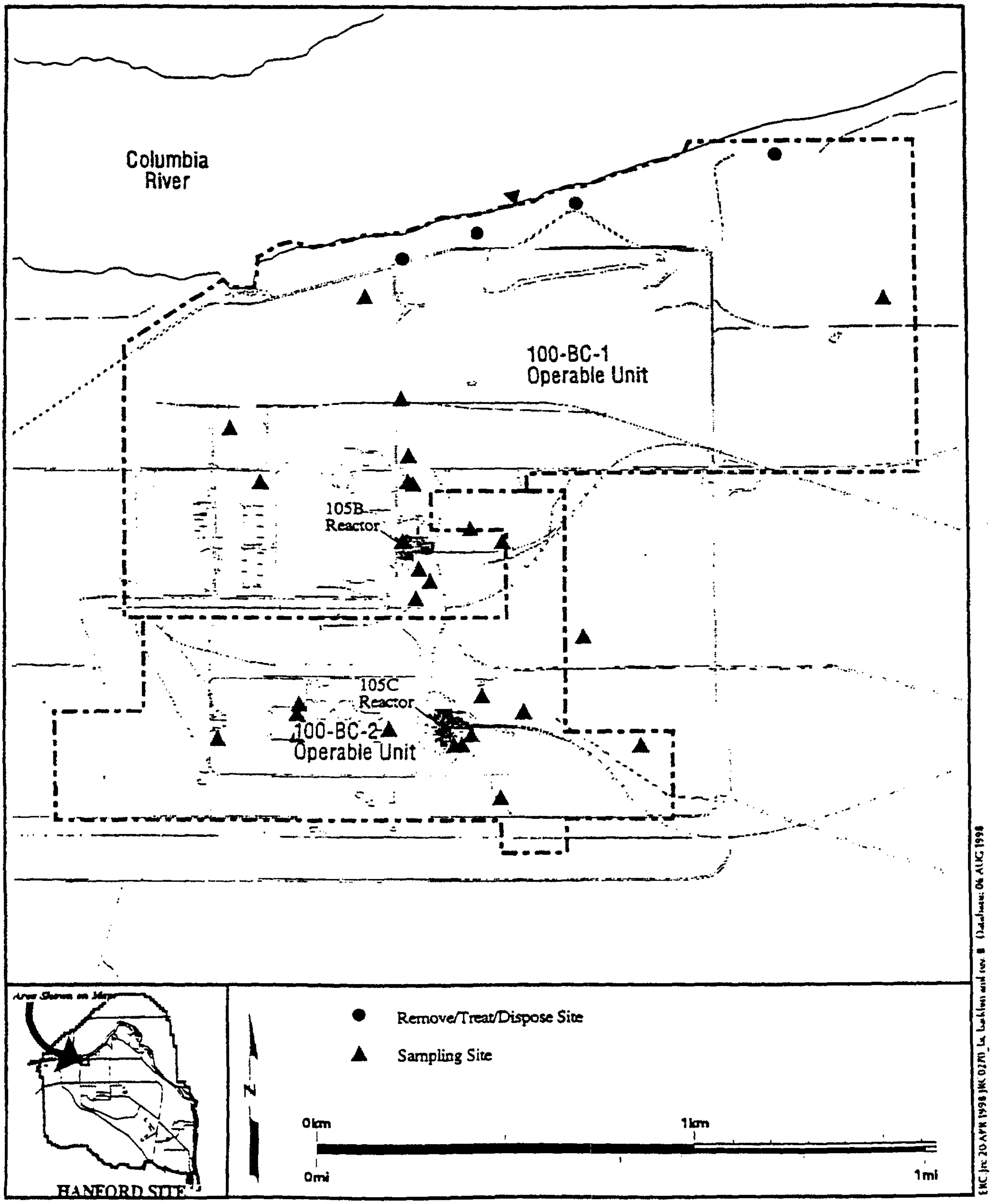


Figure 3. 100 Area Remaining Site in the 100-DR-1 and 100-DR-2 Operable Units.

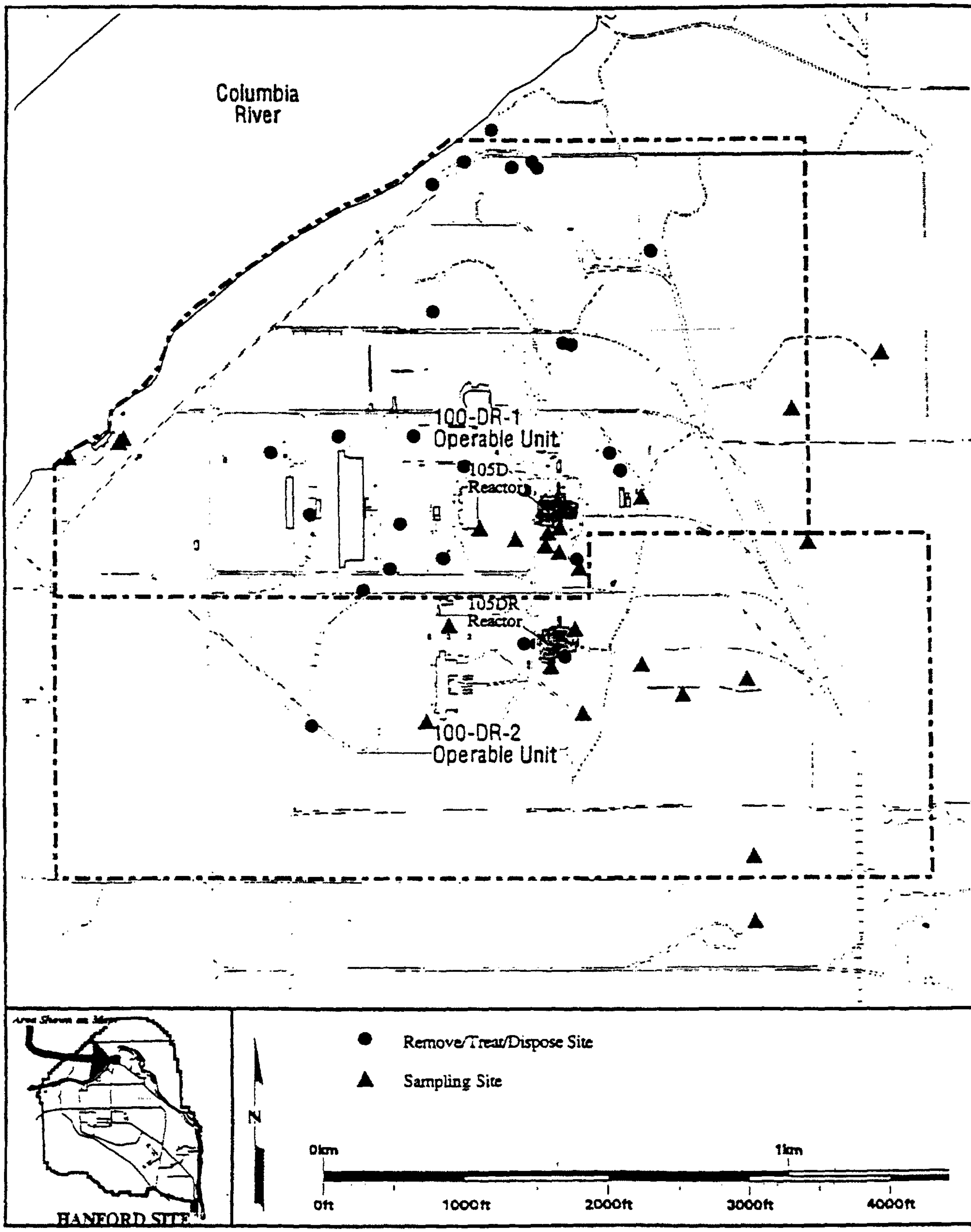


Figure 4. 100 Area Remaining Site in the 100-HR-1 and 100-HR-2 Operable Units.

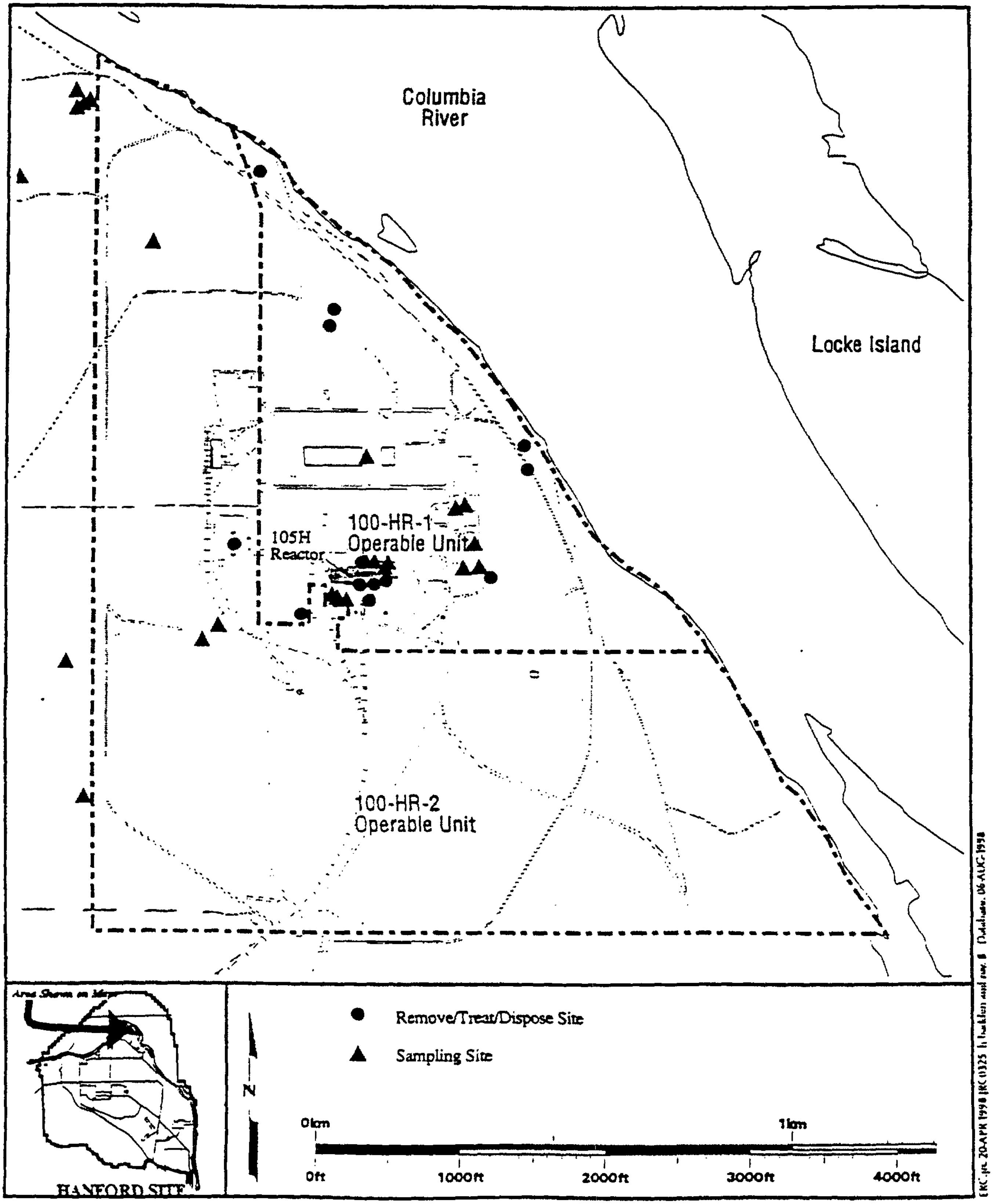


Figure 5. 100 Area Remaining Site in the 100-FR-1 and 100-FR-2 Operable Units.

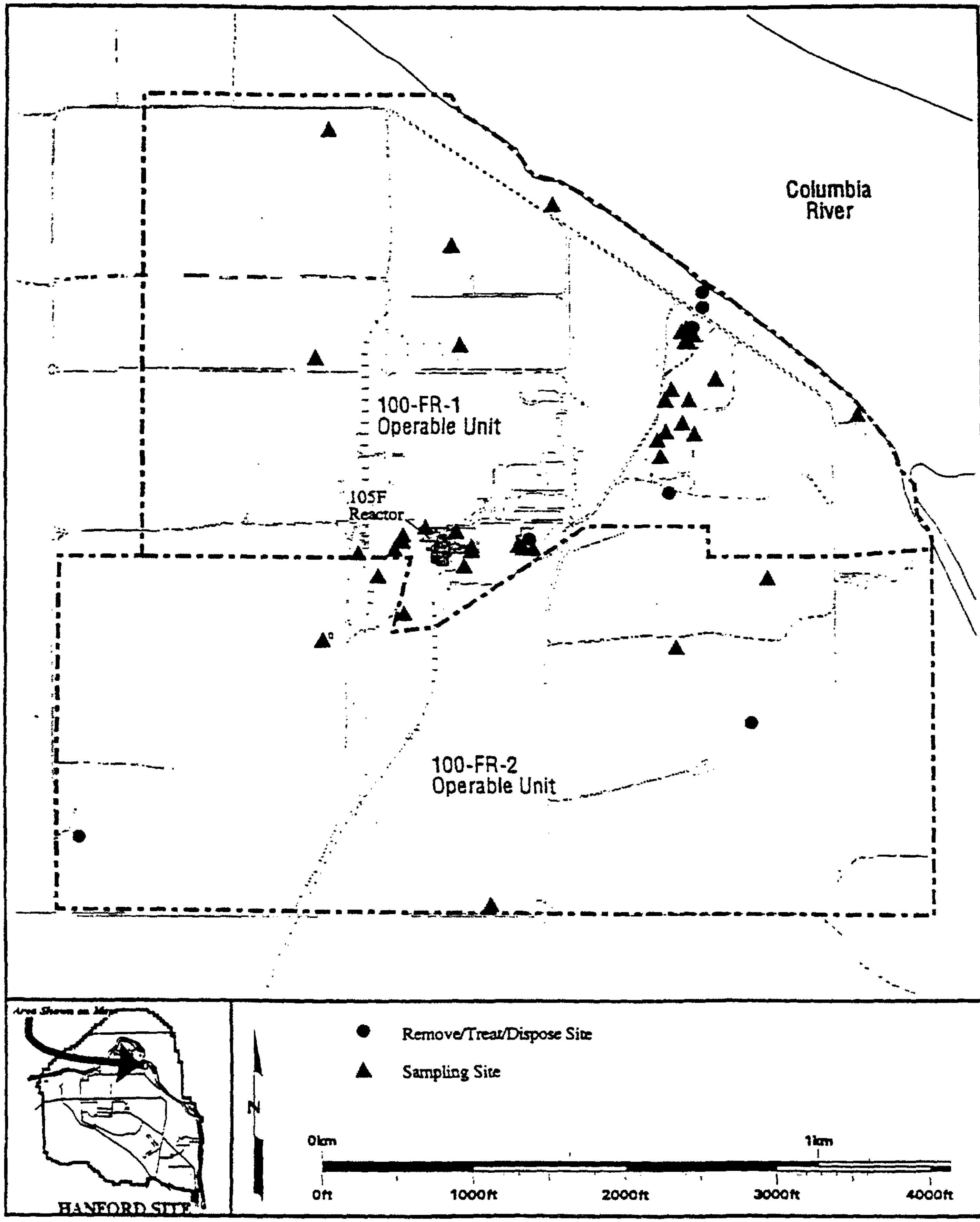


Figure 6. 100 Area Remaining Site in the 100-KR-1 and 100-KR-2 Operable Units.

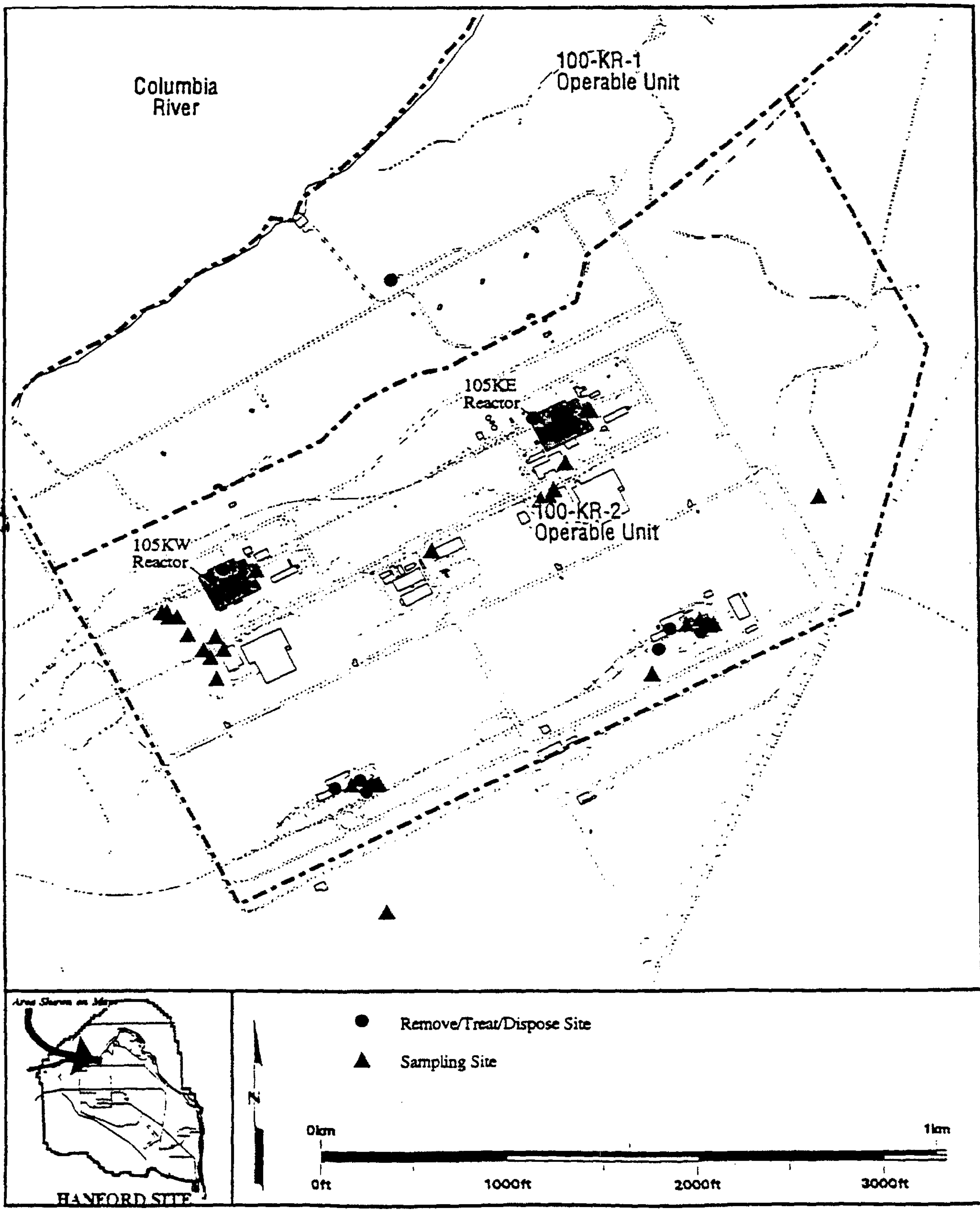


Figure 7. 100 Area Remaining Site in the 100-IU-2 Operable Unit.

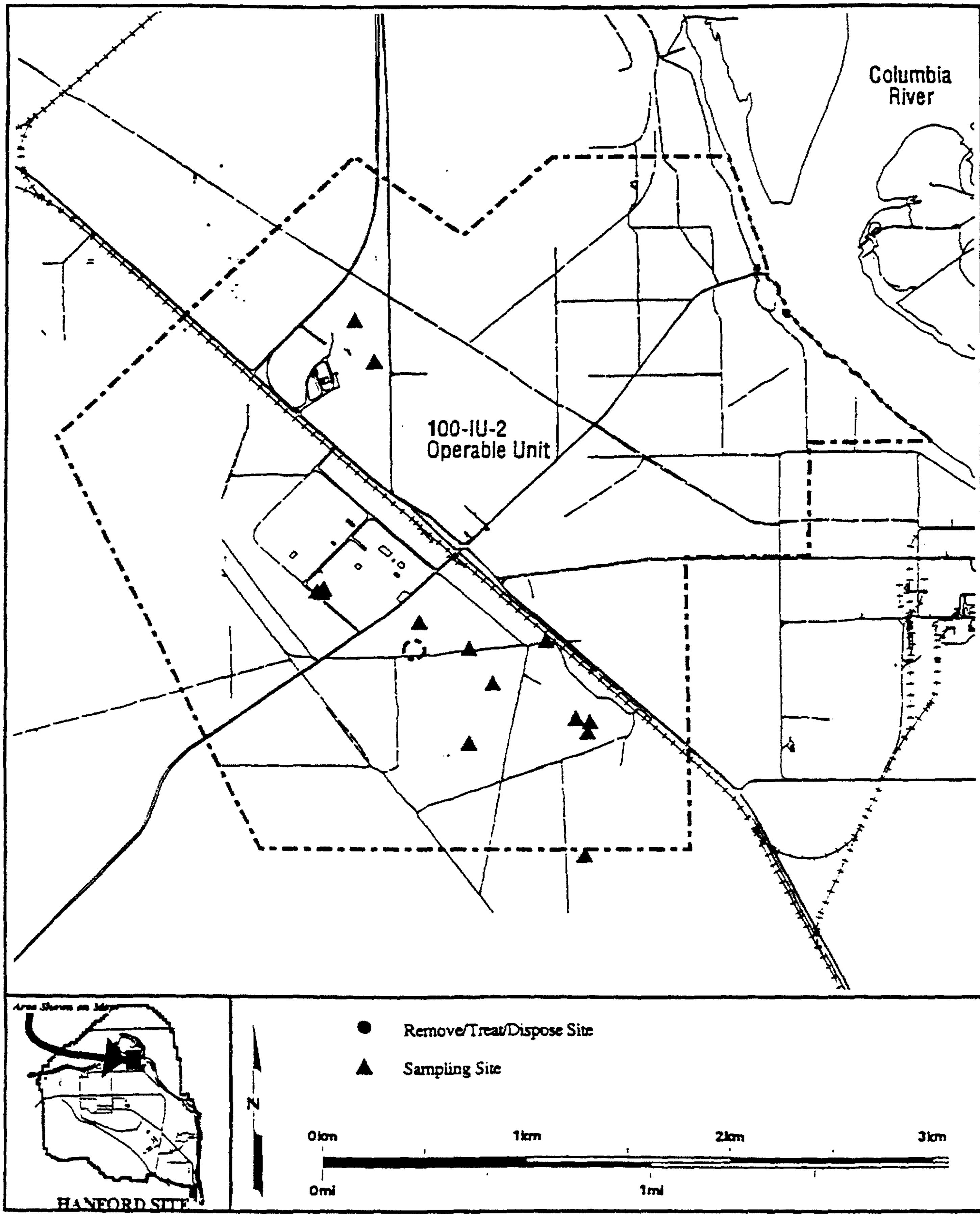


Figure 8. 100 Area Remaining Site in the 100-IU-6 Operable Unit.

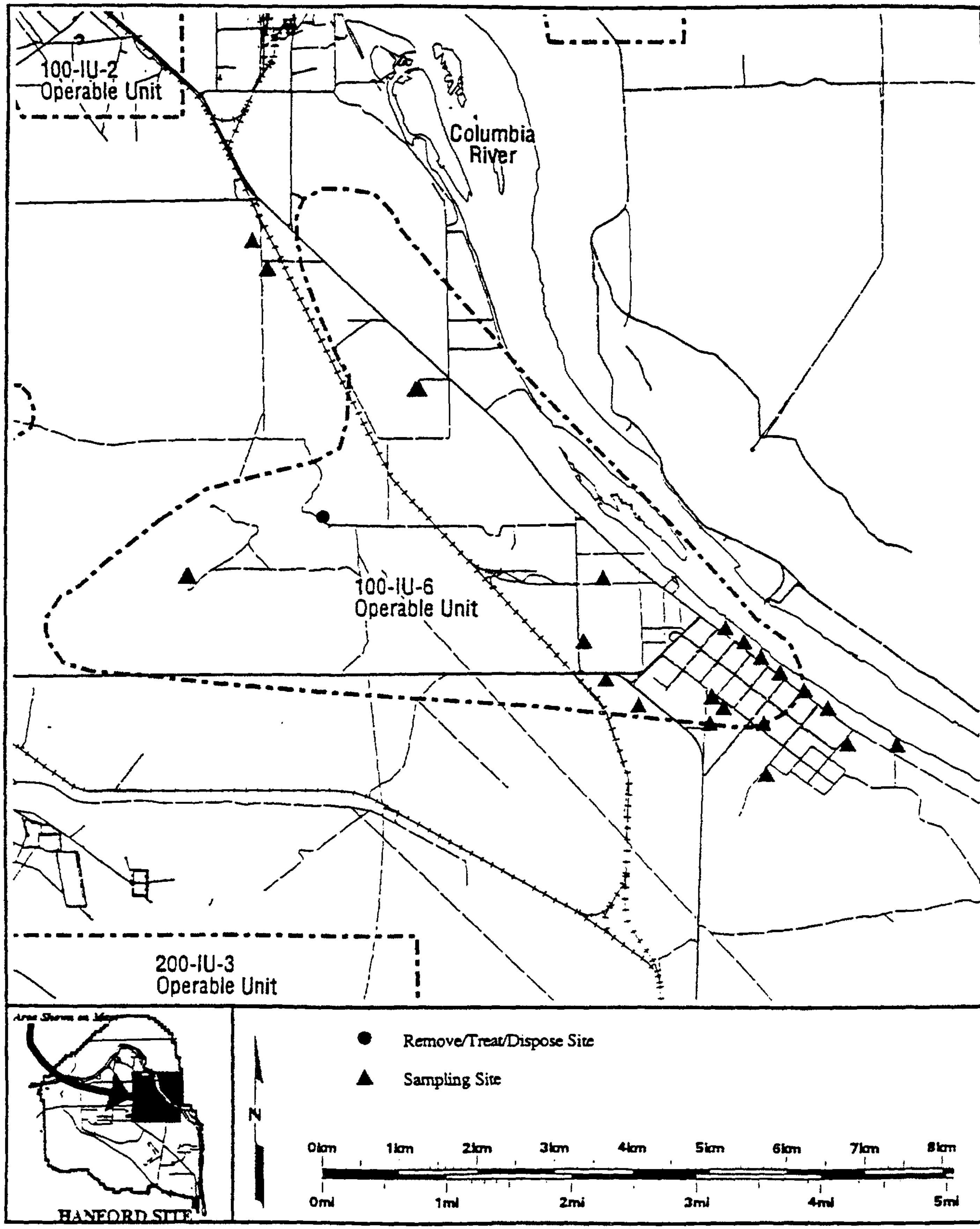
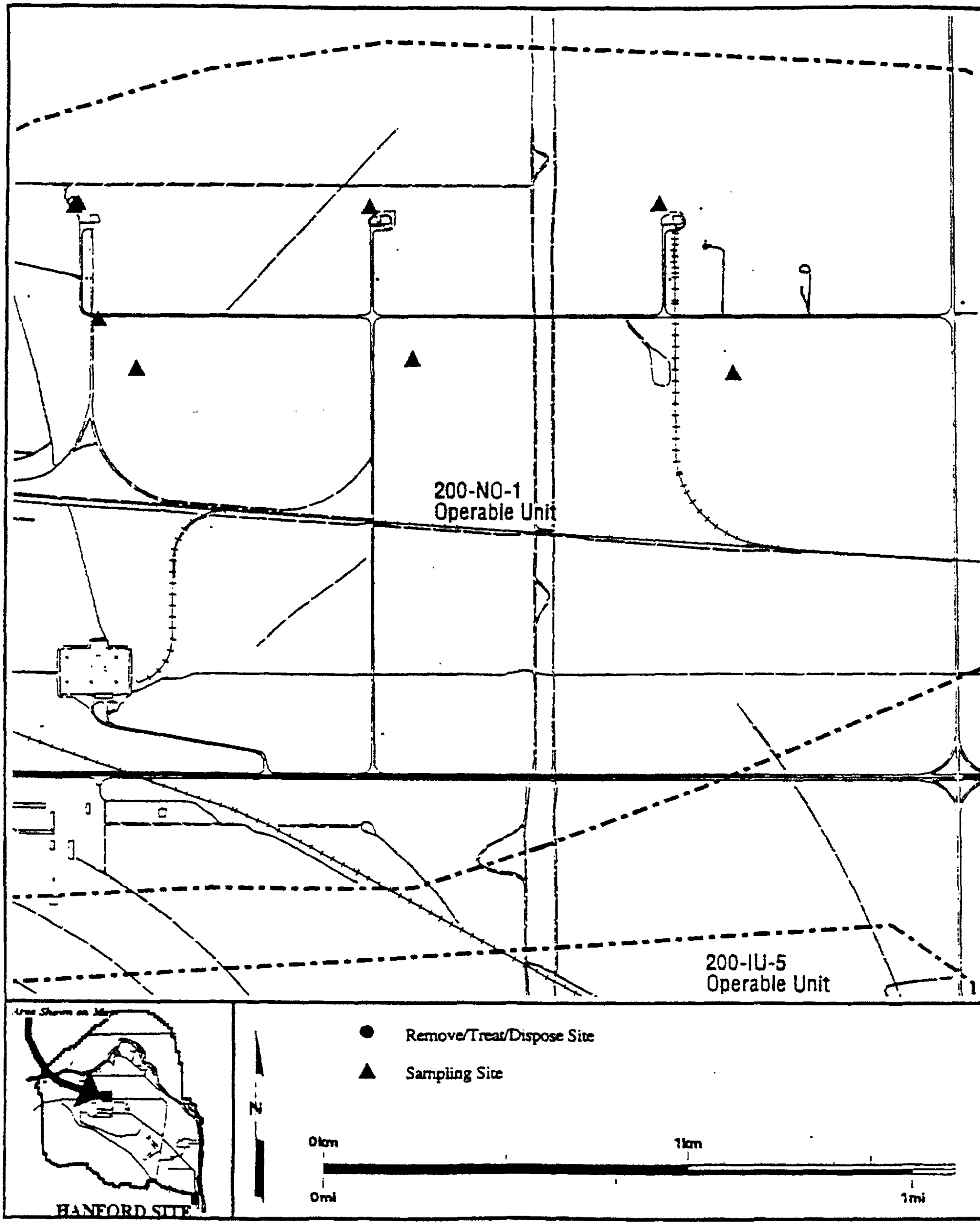


Figure 9. 100 Area Remaining Site in the 200-CW-3 Operable Unit.



IV. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The DOE, Ecology, and EPA developed a community relations plan (CRP) April l990 as part of the overall Hanford Site restoration. The CRP was designed to promote public awareness of the investigations and public involvement in the decision-making process. The CRP summarizes known concerns based on community interviews. Since that time, several public meetings have been held and numerous fact sheets have been distributed in an effort to keep the public informed about Hanford Site cleanup issues. The CRP was updated in 1993 and again in 1996 to enhance public involvement.

The *Proposed Plan for Interim Remedial Actions at the 100 Area Remaining Sites*, (DOE-RL-97-83) and the *100 Area Source Operable Unit Focused Feasibility Study* (DOE-RL-94-61) were made available to the public in both the Administrative Record and the information repositories maintained at the locations listed below on November 2, 1998. A fact sheet, which explained the proposed action and informed the public that they could request a public meeting, was mailed to approximately 2,000 people. In addition, an article appeared in the bi-monthly newsletter, the *Hanford Update*, detailing the start of public comment. The *Hanford Update* is mailed to over 4,000 people. The proposed plans were made available to members of the Hanford Advisory Board.

ADMINISTRATIVE RECORD (contains all project documents)

U.S. Department of Energy
Richland Operations Office
Administrative Record Center
2440 Stevens Center
Richland, Washington 99352

INFORMATION REPOSITORIES (contain limited documentation)

University of Washington
Suzzallo Library
Government Publications Room
Seattle, Washington 98195

Gonzaga University, Foley Center
E. 502 Boone
Spokane, Washington 99258

Portland State University
Branford Price Millar Library
Science and Engineering Floor
SW Harrison and Park
Portland, Oregon 97207

DOE Richland Public Reading Room
Washington State University, Tri-Cities
2770 University Drive, Room 101 L
Richland, Washington 99352

The notice of the availability of these documents was published in the *Tri-City Herald* on November 1, 1998. The public comment period was held from November 2 to December 2, 1998. No public meeting was requested during the comment period. All submitted written comments can be found in the Administrative Record. Responses to the public comments received during the public comment period are included in the Responsiveness Summary (Appendix B) and were considered during the development of this Interim Action ROD.

This decision document presents the selected interim remedy for the 100 Area Remaining Sites at the Hanford Site, which was chosen in accordance with CERLA, as amended by SARA and (to the extent practicable) the NCP. The decision for these sites is based on the Administrative Record.

V. SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

This Interim Action ROD addresses contaminated soils, structures, and debris found at the sites listed in Tables A-1and Table A-2 and contaminated equipment from the 105-B, 105-D, 105-H, 105-KE, and 105-KW reactor buildings but does not address groundwater that has been contaminated by releases from these sites. The September 1995 ROD and the ROD Amendment for the 100 Areas addressed the higher priority sites. The 100 Area Remaining Sites, while of a lesser priority, may impose a threat to human health or the environment. The purpose of the interim remedial actions are to identify and reduce potential future threats to human health and the environment from waste site contaminants. An additional ROD will be issued in the future to address the burial grounds in the 100 Area. It is anticipated that after all remedial actions are completed, a final risk assessment for the l00 Area NPL site will be completed. A final ROD will then be issued for the NPL site.

Consistent with the previous 100 Area soil cleanup decisions, and pending issuance of a final land use determination, the Tri-Parties have agreed to remediate the 100 Area Remaining Sites to the extent practicable so future use of the land is not precluded by contamination left from past Hanford Site operations. This would be accomplished by remediating the sites to minimize potential direct exposure effects, air and groundwater releases, and ecological and cultural impacts. Any remaining risks will be addressed in a final ROD for the 100 Area NPL site and a future 200 Area ROD for the 200-CW-3 OU.

The 100 Area of the Hanford Site is complex and contains many individual waste sites. Based on the circumstances presented by the 100 Area, the use of two innovative approaches to remediation of the individual waste sites will enhance the efficiency of the selected remedy. The approaches are the " observational approach" and the "plug-in approach".

The Observational Approach

This approach relies on information from historical process operations including historical liquid effluent discharges from 1944 to 1969 and information from LFIs on the nature and extent of contamination, combined with a "characterize-and-remediate-in-one-step" methodology. Remediation of the sites specified in Table A-1 proceeds until it can be demonstrated through a combination of field screening and confirmational sampling that cleanup goals have been achieved.

The interim remedial action selected by this Interim Action ROD has the following specific RAOs:

- Protect human and ecological receptors from surface exposure to contaminants in soils, structures, and debris by exposure, inhalation, or ingestion of radionuclides, inorganics, or organics.

- Control the sources of groundwater contamination to minimize the impacts to groundwater resources, protect the Columbia River from further adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.

- Provide the highest degree of protection of human health and the environment through removal and disposal of the mass of contamination so institutional controls and/or long-term monitoring are not required.

These objectives will be achieved by implementing the Remove/Treat/Dispose alternative, as appropriate or required.

Plug In Approach

This Interim Action ROD also provides a regulatory framework for a “plug-in” approach for input to remediation decisions for analogous sites instead of a rigorous site characterization effort that is often conducted during a remedial investigation. The plug-in approach is a process that is proposed for more than 161 of the 100 and 200 Areas sites identified to date (see Table A-2). In the future, the plug-in approach is proposed for any newly discovered 100 Area waste site that is similar to the 100 Area Remaining Sites. The plug-in approach benefits the goal of remediating waste sites in the 100 Area. The traditional CERCLA approach for remedy selection would require the development of multiple proposed plans and RODs that, for similar sites, would be nearly identical to the feasibility studies, proposed plans, and RODs already developed and proven to be successful. The plug-in approach allows remedial actions to begin much more quickly at a site and without the need for redundant remedy selection processes.

The plug-in approach requires three main elements to establish its use as a cost-effective tool for remediation in the 100 Area. First, multiple sites must be identified that share common physical and contaminant characteristics. These characteristics are referred to as the site profile. Second, a remedial alternative, or standard remedy, must be established that has been shown to be protective and cost effective for sites sharing the common site pro file. Lastly, sites sharing a common site profile must be shown to require remedial action due to contaminant concentrations that pose a risk to human health and the environment.

The following information describes how the plug-in approach is proposed to be used for remedy selection at the 100 Area Remaining Sites. Costs are also provided for addressing sites that are candidates for the plug-in approach.

Establishing of the Site Profile

The site profile for the 100 Area sites is based on the site characteristics contained in the focused feasibility study. These characteristics are defined by the following:

- Types of contaminants (e.g., radiological, chemical)
- Types of contaminated environmental media (e.g., soil)
- Types of contaminated waste material (e.g., concrete, metal, wood).

Burial grounds are not included in this site profile. The Tri-Parties have agreed to address the 100 Area Burial Grounds in a separate proposed plan and ROD because they are significantly different from other 100 Area sites. Burial grounds are typically larger and contain heterogeneous solid wastes generated principally from the removal of irradiated reactor equipment.

Based on available information, the Tri-Parties have determined that the 100 and 200 Areas sites listed in Table A-2 share common physical and contaminant characteristics with those sites listed in Table A-1. Sampling is proposed in order to verify that these sites meet the site profile.

Establishing of the Standard Remedy

The Remove/Treat/Dispose alternative has been chosen in previous 100 Area decision documents. The waste sites covered in the previous decision document share many of the characteristics as waste sites covered in this Interim Action ROD. The Remove/Treat/Dispose alternative has also been proven in the field to be both cost-effective and environmentally protective. Full-scale remediation in the 100 Areas using Remove/Treat/Dispose alternative began in July 1996. To date, these actions have resulted in the disposal of over one million tons of contaminated soil and debris to the ERDF.

Because of its proven success, the Tri-Parties are selecting the Remove/Treat/Dispose alternative as the standard remedy for the plug-in approach to be used to evaluate the 100 and 200 Areas sites listed in Table A-2 and for similar waste sites that may be identified in the future in the 100 Area.

Establishing the Need for Remedial Action

Waste sites that share a common site profile will plug-in to the standard remedy if it is determined that the sites require remedial action due to an unacceptable risk to human health and the environment. For sites listed in Table A-2, insufficient information exists to determine if contamination is above unacceptable levels. At these sites, sampling will be performed to determine contaminant types and concentrations, and the results will be used to determine if the sites will require remedial action.

Remedial action will be required for sites that contain radioactive contaminants that exceed 15 mrem/yr above natural background and/or sites that contain chemical contaminants that exceed a hazard index of 1 or *Model Toxics Control Act* (MTCA) Method B cleanup levels. For sites that do not exceed these criteria, no further action is proposed. Should sampling determine that a site does not fit the site profile but contains contaminants that exceed these criteria, remedial action will be deferred to a separate CERCLA action or other regulatory authority for cleanup.

Newly discovered 100 Area sites may be identified after the ROD or subsequent decision documentation is signed and the Hanford RCRA Permit is modified. Where these newly discovered sites are determined by the Tri-Parties to fit the site profile and require remedial action, these sites will be remediated using the standard remedy of Remove/Treat/Dispose alternative.

Remediation goals established for the candidate plug-in sites will be the same as those goals established for the preferred remedy as identified in the "Preferred Interim Remedial Alternative" section of this Interim Action ROD.

To ensure that the public is involved in the application of the plug-in approach to the 100 Area sites, the Tri-Parties will publish Explanations of Significant Differences when newly discovered sites are proven through analysis to be above cleanup levels and can plug-in to the standard remedy, or when sites listed in Table A-2 or newly discovered sites are above cleanup levels but cannot plug-in to the standard remedy because the sites do not contain characteristics similar to the 100 Area sites listed in Table A-1. These sites will be addressed through a separate cleanup action.

VI. SITE CHARACTERISTICS

An overview of the physical characteristics of the 100 Area, available historical data that were evaluated, summaries of the 100 aggregate area studies, and the results of the 100 Area Remaining Sites specific waste site evaluations are presented below.

Site Geology and Hydrology

The Hanford Site is located in the Pasco Basin, a topographic and structural basin situated in the northern portion of the Columbia Plateau. The Plateau is divided into three general structural subprovinces: the Blue Mountain,; the Palouse; and the Yakima Fold Belt. The Hanford Site is located near the junction of the Yakima Fold Belt and the Palouse subprovinces.

Geology

The 100 Area is located in the northern portion of the Hanford Site, adjacent to the Columbia River. The geologic structure beneath the 100 Area is similar to much of the rest of the Hanford Site, which consists of three distinct levels of soil formations (see Figure 2). The deepest level is a thick series of basalt flows that have been warped and folded, resulting in protrusions that crop out as rock ridges in some locations. The top of the basalt in the 100 Area ranges in elevation from 46 m (150 ft) near the 100-H Area to 64 m (210 ft) below sea level near the 100-B/C Area. Layers of silt, gravel, and sand known as the Ringold Formation form the middle level. The

Ringold Formation shows a marked west-to-east variation in the 100 Area. The main channel of the ancestral Columbia River flowed along Umtanum Ridge and through the 100-B/C and 100-K Areas, before turning south to flow along Gable Mountain and/or through the Gable Mountain-Gable Butte gap, leaving relatively thin deposits of sand and gravel in the 100-B/C and 100-K Areas. The uppermost level is known as the Hanford formation and consists of gravel and sands deposited by catastrophic floods during glacial retreat. In the 100 Area, the Hanford formation consists primarily of Pasco gravels facies, with local occurrences of the sand-dominated or slackwater facies. The predominant soil types in this area are Burbank loamy sand (34%), Ephrata sandy loam (23%), Ephrata stony loam (23%), and Quincy sand (17%). Other soil types include Pasco silt loam, Kiona silt loam, and river wash.

Groundwater. Groundwater flows into the 100 Area from the south, through the gaps between Umtanum Ridge, Gable Butte, and Gable Mountain and discharges to the Columbia River. Groundwater flow is predominantly to the north in the 100 BC Area and northwest in the 100 K Area. Groundwater flow in the 100 D Area is to the northwest and changes to northeastern across the horn towards the 100 H Area. The 100 H Area and 100 F Area groundwater flow is predominantly to the east and southeast. The depth to the water table in the 100 Area ranges from 1 meter near the river to approximately 30 meters near the reactor buildings.

Columbia River. The Columbia River is the second largest river in North America and the dominant surface-water body on the Hanford Site. The existence of the Hanford Site has precluded development of this section of river for irrigation and power. The uses of the Columbia River include the production of hydroelectric power, extensive irrigation in the Mid-Columbia Basin, and as a transportation corridor for barges. Several communities located on the Columbia River rely on the river as their source of drinking water. Water from the Columbia River along the Hanford Reach is also used as a source of drinking water by several onsite facilities and for industrial uses. In addition, the Columbia River is used extensively for recreation, including fishing, hunting, boating, sailboarding, waterskiing, diving, and swimming.

Historical Data. An integral part of the 100 Area investigations was the acquisition, evaluation, and utilization of records pertaining to the construction, operation, and decontamination/decommissioning of the reactors and related facilities. This information is categorized as historical information and includes operations records and reports, engineering drawings, photographs, interviews with former or retired operations personnel, and data from sampling and analysis of facilities and the local environment.

A primary reference for radiological characterization of the 100-Area OU sources is a sampling study of the 100 Area performed during 1975-1976 by Dorian and Richards, *Radiological Characteristics of the Retires 100 Area*(UNI-946). In the 100 Area source OU areas, Dorian and Richards collected samples from retention basins, effluent pipelines and surrounding soil, liquid waste disposal trenches, retention basin sludge disposal trenches, miscellaneous trenches, cribs, french drains, and dummy decontamination drains. Samples of soil were collected from the surface and subsurface to a maximum of 11.6 m (38 ft) below grade in the 100-B/C Area and 7.6 m (25 ft) below grade in the 100-D/DR and 100-H Areas. Samples were also collected from retention basin sludge and concrete and from effluent line scale and sludge. The samples were analyzed for radionuclides and the inventories of radionuclides for the facilities and sites were calculated. Results from Dorian and Richards were a major resource used to develop the 100 Area conceptual models and LFI data needs. It should be noted, however, that only concentrations and inventories of selected radionuclides were reported in the 1975-1976 study. In particular, nickel-63, which is generally present at activities on the same order of magnitude as cobalt-60, was reported for only some samples; technetium-99 was not evaluated; and daughter product radionuclides of strontium-90 and cesium-137, which have approximately the same activities as the parent nuclides, were not included in summaries of total activity.

Background Study. The evaluation of levels of naturally occurring constituents in Hanford Site area soils and groundwater was undertaken to better understand baseline conditions against which to evaluate potential cleanup levels and actions. A report on inorganic constituents in soils was released in May 1994 by DOE. Preliminary results of the evaluation of radionuclides in soils was released by DOE in July 1995. For the purposes of the interim actions discussed in this Interim Action ROD, background considerations for radionuclides are being considered in terms of mrem/year dose, and then by specific analyte(s), as appropriate. For the 100 Area, the average background dose associated with radionuclides in soils is approximately 60 mrem/yr, and the 95% upper confidence limit (UCL) dose is approximately 78 mrem/yr.

Ecological Analysis

Ecological surveys and sampling have been conducted in the 100 Area and in and along the Columbia River adjacent to the 100 Area (Sackschewsky and Landeen 1992, *100 Area CERCLA Ecology Investigation* [WHC-EP-0448]; Weiss and Mitchell 1992, *A Synthesis of Ecological Data from the 100 Area of the Hanford Site* [WHC-EP-0601]). Sampling included plants with either a past history of documented contaminant uptake or with an important position in the food chain, such as river algae, reed canary grass, tree leaves, and asparagus. In addition, samples were collected of caddisfly larvae (next step in the food chain from algae), burrow soil excavated by mammals and ants at waste sites, and pellets cast by raptors and coyote scat to determine possible contamination of the upper end of the food chain. Bird, mammal, and plant surveys were conducted and reported in Sackschewsky and Landeen. Current contamination data have been compiled from other sources, as well as ecological pathways and lists of all wildlife and plants identified at the site, including threatened and endangered species. This information has been published by Weiss and Mitchell.

Cultural Resources Review

In compliance with Section 106 of the *National Historic Preservation Act*, the Hanford Cultural Resources Laboratory conducted an archaeological survev during fiscal year 1991 of the 100 Area reactor compounds on the Hanford Site. This survey was conducted as part of a comprehensive cultural resources review of the 100 Area OUs in support of CERCLA characterization activities. The work included a literature and records review and a pedestrian survey of the project area and followed procedures presented in the Hanford Cultural Resources Management Plan.

Nature and Extent of Contamination

All the 100 Area single-pass reactor operations were virtually identical, leading to similar releases of contaminants to similar type waste sites. The LFIs in various 100 Area OUs verified that the contamination of waste sites was very similar in all 100 Area OUs. Process knowledge and available data were used to identify contaminants of potential concern (COPCs).

Based on their functions in the reactor process, facilities and their associated waste sites are grouped in the three categories:

- Reactor cooling water treatment and supply
- Reactor products and effluent handling
- Reactor support facilities.

A continuous supply of high-quality water was essential to reactor operations to prevent reactor core damage from the heat generated by fission reactions. Columbia River water was treated before it was introduced to the reactor. Use and spillage of water treatment chemicals (e.g., sodium dichromate, manganese compounds, copper compounds, alum, ammonium nitrate, sulfuric acid, caustic soda, and their impurities arsenic and mercury) resulted in the contamination of the facilities and soil.

Cooling water passed through the reactors and became contaminated with both radioactive and nonradioactive contaminants. This water was discharged to the soil column. The COPCs from this activity include the radionuclides americium-241, carbon-14, cesium-137, cobalt-60, europium-152, europium-154, nickel-63, plutonium-238, plutonium-239/240, radium-226, strontium-90, thorium-228, tritium, uranium-233/234, and uranium-238. Inorganic contaminants include antimony, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nitrate, nitrite, and zinc. Organic contaminants include trichloroethene, polychlorinated biphenyls (PCBs), and polvaromatic hydrocarbons.

Contaminants from support facilities include both radioactive and nonradioactive contaminants. Investigations of several sanitary sewer systems indicated that radioactive material were likely discharged when contaminated workers were decontaminated. In addition, records indicate that most of the combustible waste was burned in pits(including solvents and paints).

The 100-IU-2 and 100-IU-6 OUs contain pre-Hanford solid waste landfills, disposal of farm chemicals. and other light industrial disposal practices. The 200-CW-3 OU contains soil contaminated with contaminants similar to those found in the 100 Area reactor areas.

Contaminated equipment and debris from the 105 Reactor buildings contain similar contaminants of concern as the 100 Area Remaining Sites.

VII. SUMMARY OF SITE RISKS

Potential risks to human health and ecological receptors have been evaluated in qualitative risk assessments for some of the individual waste sites in the 100 Area. Where remedial investigation results are not available, potential risks were evaluated by comparison to analogous sites with similar process history, similar environmental media, similar waste material, and similar contaminants. As discussed in the *100 Area Source Operable Unit Focused Feasibilily Study* (DOE-RL-94-61), the Tri-Parties have designated high- or medium-priority waste sites within the 100 Area as requiring remediation. The following paragraphs discuss the results of applying the evaluation methods of the focused feasibility study report to the 100 Area sites. The results of these evaluations show that remedial measures are warranted at 46 of the 100 Area sites. In the Superfund process, potential risks to human health and the environment are evaluated to determine if significant risks exist due to site contaminants. Two types of potential human health effects due to contact with site contaminants are evaluated at Superfund sites. The first is the potential increase in cancer risks. This potential increase is expressed exponentially as 1×10^{4}, 1×10^{-5}, and 1×10^{-6} (one in ten thousand, one in one hundred thousand, and one in a million, respectively). This means that for a 1×10^{-4} risk, if 10,000 people were exposed to a contaminant of concern for some period of time, one additional person could be expected to be diagnosed with cancer in his/her lifetime. Based on current national cancer rates, approximately 2,500 people out of 10,000 are expected to be diagnosed with cancer. For the second type of potential human health effect, noncarcinogenic health impacts, a hazard index is calculated. A hazard index greater than or equal to 1.0 may pose a potential adverse human health risk.

Human Health Risk

Contamination detected or known to exist at waste sites poses the potential for increased human health risk to future site users. The level of potential health risk posed by contaminants differs depending upon the future site use. Two future site use scenarios were evaluated in the qualitative risk assessments: an occasional use scenario (which corresponds to a recreational use) and a frequent use scenario (which corresponds to a residential use). In either case, future users could be exposed to contaminants in soil through ingestion of soil, inhalation of wind-blown dust, or external exposure to radiation.

Based on the qualitative risk assessments, the contaminants in 100 Area soil providing the highest contribution to potential increased human health risks include heavy metals (eg., chromium, lead, and zinc), various radionuclides (e. g., cesium-137, cobalt-60, strontium-90, and europium-152), and organic compounds (e.g., PCBs and polyaromatic hydrocarbons [PAH]). Environmental media and waste material contaminated by these constituents include soil, metallic waste, concrete, asbestos, and miscellaneous debris. Depth of contamination varies from surface soils to structures such as cribs and reverse wells with potential for much deeper contamination. The 46 waste sites listed in Table A-1 are considered by the Tri-Parties to have sufffficient analytical or analogous data to conclude that these contaminants pose a risk to human health and the environment.

Table A-1 provides a comparison of representative maximum contaminant levels with the preliminary remediation goals in soil for the contaminants of concern. The preliminary remediation goals generally represent a 1 x 10^{-6} risk level, or hazard index of 1, for unrestricted land use. Representative maximum contaminant levels are presented for five waste sites in the 100-DR-1, 100-DR-2, and 100-FR-1 OUs. These data were taken from the qualitative risk assessments for waste sites 100-D-4, 100-D-12, 100-D-31, 116-D-5, and 116-F-15. A comparison of these data to the preliminary remediation goals indicates that the risks to future site users would be expected to be above the risk range of 1 x 10^{-4} to 1 x 10^{-6} and above a hazard index of 1. Calculation of site risk from these data shows that these contamination levels present an average risk of 7.2 x 10^{-3} . This risk level shows that remedial action is necessary at these sites.

Ecological Risk

Ecological risks from the 100 Area sites were estimated by evaluating potential impacts to the Great Basin pocket mouse. Where remedial investigation results were not available, ecological risks were evaluated by comparing 100 Area sites to analogous sites with similar characteristics. Risks to the Great Basin mouse were estimated assuming the food pathway was the primary route of exposure to both radionuclides and inorganic/organic contaminants. An environmental hazard quotient (EHQ) equal to or greater than 1.0 was considered to indicate that individual mice were at risk.

Nearly all of the radiological risk (EHQ > 1.0) to the Great Basin mouse at the 100 Area sites was attributable to strontium-90, although cobalt-60 also exceeded an EHQ of 1.0 at some sites. A comparison to analogous sites indicates that the risk estimates to the Great Basin pocket mouse due to exposure to heavy metals and various organic contaminants at selected sites would also exceed an EHQ of 1.0.

VIII. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives are site-specific goals that define the extent of cleanup necessary to achieve the specified level of remediation at the site. The RAOs are derived from applicable or relevant and appropriate requirements (ARARs), the points of compliance, and the restoration time frame for the remedial action. The RAOs were formulated to meet the overall goal of CERCLA, which is to provide protection to overall human health and the environment.

Contaminants of concern were identified based on a statistical and risk-based screening process for affected media. The potential for adverse effects to human health and the environment were initially identified in the LFI report and were further evaluated in the qualitative risk assessment. Findings of these assessments are summarized in the previous section.

Land Use

A key component in the identification of RAOs is determining the current and potential future land use at the site. These long-range land-use assumptions are not predictors of long-term land use (i.e., beyond 20 to 30 years) and should not be used as predictors of land use beyond reasonable lengths of time, nor for land-use changes resulting from longer term events. The Hanford Future Site Users Working Group (the Working Group) was convened in April 1992 to develop recommendations concerning the potential use of lands after cleanup. A draft of DOE's HRA-EIS was released for public comment in August 1996. A significantly revised draft of the HRA-EIS was issued for public comment on April 23, 1999. This document evaluated five "action alternatives," each of which represented a Federal, state, local agency, or Tribe's preferred land-use alternative. Preferred land-uses for the 100 Area included varying degrees and combinations of preservation, conservation, research and development, and recreation. The public comment period on the revised draft HRA-EIS ended on June 7, 1999. DOE is currently evaluating comments in preparation for issuance of a land-use determination. However, at this time the land-use of the 100 Area has not been established. For the purposes of this interim action, the RAOs are for "unrestricted use," consistent with the previous 100 Area soil cleanup decisions. The Tri-Parties may re-evaluate RAOs and cleanup goals selected in this Interim Action ROD following issuance of the land-use determination.

Chemicals and Media of Concern. Risks from soil contaminants of concern were identified at levels that exceed the EPA risk threshold and may pose a potential threat to human health. The NCP requires that the overall incremental cancer risk (ICR) at a site not exceed the range of 1×10^{-6} to 1×10^{-4}. For systemic toxicants or noncarcinogenic contaminants, acceptable exposure levels shall represent levels to which the human population may be exposed without adverse effect during a lifetime or part of a lifetime. This is represented by a hazard index. For sites in the state of Washington where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 1×10^{-5}, and the noncarcinogenic hazard index is less than 1, action generally is not warranted unless there are adverse environmental impacts or other considerations, such as exceedances of maximum contaminant levels (MCLs) or non-zero maximum concentration guideline levels (MCLGs).

Description of Remedial Action Objectives

The RAO's have been identified for contaminated near-surface and subsurface soils, structures, and debris at the 100 Area OUs waste site for this interim action. The RAOs and the principal requirements for achievement of the objectives are discussed in the following paragraphs.

The interim remedial action selected by this Interim Action ROD has the following specific RAOs:

1. *Protect human and ecological receptors from exposure to contaminants in soils, structures, and debris by dermal exposure, inhalation, or ingestion of radionuclides, inorganics, or organics.*

   Protection will be achieved by reducing concentrations of, or limiting exposure pathways to, contaminants in the upper 4.6 m (15 ft) of the soil exposure scenario. The levels of reduction will be such that the total dose for radionuclides does not exceed 15 mrem/yr above Hanford Site background for 1,000 years following rernediation and State of Washington MTCA Method B levels for inorganics and organics. (See Table 1)

2. *Control the sources of groundwater contamination to minimize the impacts to groundwater resources, protect the Columbia River from further adverse impacts, and reduce the degree of groundwater cleanup that may be required under future actions.*

   Protection will be such that contaminants remaining in the soil after remediation do not result in an adverse impact to groundwater that could exceed MCLs and non-zero MCLGs under the *Safe Drinking Water Act* (SDWA) (see Table 1). The SDWA MCL for radionuclides will be attained at a designated point of compliance beneath or adjacent to the waste site in groundwater. The location and measurement of the point of compliance will be defined by EPA and Ecology. Monitoring for compliance will be performed at the defined point.

   Protection of the Columbia River from adverse impacts so contaminants remaining in the soil after remediation do not result in an impact to groundwater and, therefore, the Columbia River, that could exceed the ambient water quality criteria (AWQC) under the *Clean Water Act* for protection of fish. Since there are no AWQC for radionuclides, MCL's will be used (see Table 1). The protection of receptors (aquatic species, with emphasis on salmon) in surface waters will be achieved by reducing or eliminating further contaminant loadings to groundwater so receptors at the groundwater discharge in the Columbia River are not subject to additional adverse risks. Measurement of compliance will be at a near-shore well, in the downgradient plume. The location and measurement will be defined by EPA and Ecology.

Residual Risks Post-Achievement of RAOs. Residual risks after meeting RAOs were estimated based on a residential land-use scenario for soils. Site risks from contaminated soils, structures, and debris (with respect to metals and organics) are reduced from greater than 1 x 10^{-3} to approximately 1 x 10^{-6}. Site risks from contaminated soils, structures, and debris with respect to radionuclides are reduced from greater than 1 x 10^{-3} to approximately 3 x 10^{-4}.

Remediation Time Frame. Completion of these actions shall be consistent with the overall goal of completing 100 Area remedial actions by the year 2018.

IX. DESCRIPTION OF ALTERNATIVES

The *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE/RL-94-61) identified six general response actions that could be applied to waste sites in the 100 Area. The alternatives evaluated for interim remedial action for the 100 Area Remaining Sites are as follows:

- No Action
- Institutional Controls
- Containment
- In Situ Treatment
- Remove/Treat/Dispose.

NOTE: The No Action, Institutional Controls, Containment, and In Situ Treatment alternatives would limit the future uses of small portions of the 100 Area, namely the waste sites themselves. A summary of alternatives considered is provided below.

No Action

The No Action alternative was evaluated to provide a baseline for comparison to the other alternatives. The alternative represents a hypothetical scenario where no restrictions, controls, or active remedial measures other than those currently existing are applied to a site.

Institutional Controls

This alternative includes deed and/or access restrictions and groundwater monitoring.

Deed restrictions would consist of limitations on certain types of land uses (e.g., prohibiting drilling or excavation) at an individual waste site. Access restrictions would include fences or signs. Groundwater monitoring would include sampling for potential changes in groundwater contaminant concentrations underlying the waste sites. These institutional controls would limit exposure to humans and would monitor changes in groundwater quality until a final response action could be evaluated and implemented.

Containment

This alternative includes the following elements:

- Institutional controls
- Groundwater monitoring
- Surface water controls
- Installation of a barrier at the surface.

As described under the Institutional Controls alternative, deed restrictions and/or access restrictions, combined with groundwater monitoring, would be implemented with surface water controls during and after installation of a surface barrier.

In Situ Treatment

This alternative applies to contaminated soil and solid waste and includes the following elements:

- Institutional controls
- Groundwater monitoring
- Surface water controls
- In situ vitrification (soil sites only)
- Dynamic compaction (soil/solid waste sites)
- Installation of a surface barrier, if needed (soil/solid waste sites)
- Void grouting (pipelines).

Specific types of in situ treatment were identified for individual waste groups in the focused feasibility study. Similarly, this alternative would encompass different treatment technologies depending upon the specific 100 Area Remaining Site for which the alternative would apply. For example, at some solid waste sites, institutional controls such as deed restrictions and/or access restrictions, groundwater monitoring and surface water controls would be implemented after completing the dynamic compaction process and surface barrier placement. Contaminated soil sites would be vitrified in place and pipelines would be grouted to eliminate void spaces. In situ treatment may not apply to some of the 100 Area sites.

Remove/Treat/Dispose

This alternative applies to contaminated soils, debris, equipment, and structures, and includes the following:

- Remove contaminated media
- Dispose media at an approved disposal facility
- Backfill excavated areas with clean material.

Under this alternative, contaminated media would be excavated, transported, and disposed at the ERDF in accordance with waste acceptance criteria established for the disposal facility. Any material that exceeds ERDF acceptance criteria would be stored within the OU (consistent with requirements) until the material is treated to meet the waste acceptance criteria or a treatability variance is approved. As the contaminated material is excavated, the material would be characterized and segregated prior to transportation. Excavation would continue until all contaminated material exceeding the cleanup goal is removed. The site would then be backfilled with clean material.

Remedial alternatives considered for the 100 Area reactor building materials are as follows:

- **No Action –** This alternative would leave contaminated materials in place at the 100 Area reactor buildings.

- **Disposal at the ERDF –** This alternative would include removal and onsite disposal of contaminated materials at the ERDF, which is designed to meet RCRA minimum technological requirements for landfills (e.g., double liners, leachate collection systems, leak detection, and final cover).

Characterization, potential treatment, packaging, and transport of 100 Area reactor building materials would be required to be disposed at the ERDF. When fully characterized, data would be compared to the ERDF waste acceptance criteria and appropriate waste profiles would be developed to demonstrate acceptability. Treatment of materials to meet waste acceptance criteria, such as RCRA land disposal restrictions, may be required. It is anticipated that the majority of these wastes can be treated onsite using a macroencapsulation technology, such as grouting. Should a material not be able to be treated onsite to meet ERDF waste acceptance criteria, the material will be sent to an offsite treatment and/or disposal facility. A determination will be made by EPA regarding the acceptability of the proposed offsite facility for receipt of the CERCLA waste. Wastes would be packaged in compliance with U.S. Department of Transportation and waste management standards prior to transport. Reuse and recycling of materials will be considered where practicable.

X. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the relative performance of each of the alternatives with respect to the nine criteria identified in the NCP. These criteria fall into three categories. The first two criteria (Overall Protection of Human Health and the Environment, and Compliance with Applicable or Relevant and Appropriate Requirements) are considered *threshold* criteria and must be met. The next five criteria are considered *balancing* criteria and are used to compare technical and cost aspects of the alternatives. The final two criteria (State Acceptance and Community Acceptance) are considered *modifying*, criteria. Modifications to remedial actions may be made based upon state and local comments and concerns. These criteria were evaluated after all public comments were received. The comparative analysis is divided into two categories: one category for the 100 and 200 Area waste sites listed in the appendices, and one category for the 100 Area reactor building materials.

100 and 200 Area Remaining Sites

The discussion presented below is general in nature, rather than OU- or site-specific, due to the similarity in characteristics of the waste sites.

The No Action alternative has been evaluated to provide a baseline for comparison to the preferred remedy. The No Action alternative represents a hypothetical scenario where no restrictions, controls, or active remedial actions are applied to a site.

Overall Protection of Human Health and the Environment

The No Action alternative does not meet this criteria. Institutional controls alone cannot be relied upon to provide protection. The Containment and In Situ Treatment alternatives would provide protection of human health and the environment by eliminating or reducing exposure to the contaminants. The Remove/Treat/Dispose alternative would provide overall protection of human health and the environment by removing and/or treating contaminants to attain protective concentrations.

Environmental Compliance with Applicable or Relevant and Appropriate Requirements

The No Action and Institutional Controls alternatives would not meet soil, groundwater, and river protection ARARs. All other alternatives are expected to be able to meet ARARs.

Long-Term Effectiveness

The No Action and Institutional Controls alternatives would not meet cleanup goals and, therefore, would not provide for long-term effectiveness. The Containment and In Situ Treatment alternative would provide a greater degree of long-term effectiveness by stabilizing and isolating the wastes in place, but both alternatives would require long-term institutional controls. The Remove/Treat/Dispose alternative would provide the greatest long-term effectiveness and permanence by removing contaminated material from the 100 Area, thus, allowing a variety of future land uses.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The No Action, Institutional Controls, Containment, and In Situ Treatment alternatives would rely on various processes of natural attenuation (most importantly radioactive decay) to reduce contaminant concentrations. The Remove/Treat/Dispose alternative would include treatment if this waste was required to meet ERDF waste acceptance criteria, such as for land disposal restriction compliance.

Short-Term Effectiveness

The No Action and Institutional Controls alternatives pose minimal risk to implement. The Containment and In Situ Treatment alternatives require technology that is readily available with minimal risk to workers. The Remove/Treat Dispose alternative would achieve protection relatively quickly, but would present a short-term risk to workers.

Implementability

The No Action alternative could easily be implemented. The Institutional Controls alternative would require administrative actions, such as deed restrictions; therefore, this alternative may not be easy to maintain implementability over a long period of time. The Containment, In Situ Treatment, and Remove/Treat/Dispose alternatives are implementable with existing technologies.

Costs

The Remove/Treat/Dispose alternative was shown to be the most cost-effective alternative, is protective of human health and the environment, and will allow for a wider range of future land use. Because of the similarities of the 100 Area Remaining Sites to the sites that have been previously assessed and are currently undergoing remediation, the Remove/Treat/Dispose alternative would continue to be the most cost-effective alternative for remediation of these sites.

Because of these cost considerations and because the other alternatives would limit the future uses of the 100 Area, detailed costs have not been provided in this Interim Action ROD for the other alternatives. The Remove/Treat/Dispose Alternative costs for the sites listed in Table A-1 are estimated to be approximately $26 million.

The cost for addressing the candidate plug-in sites listed in Table A-2 is estimated at $30 million.
The two major cost elements associated with the use of the plug-in approach at these sites are as
follow:

- Sampling of sites identified in Table A-2 = $12 million
- Remediation of plug-in sites = $18 million (for the purposes of this cost estimate, approximately 20% of the 161 plug-in sites are assumed to require remedial action using the standard remedy of Remove/Treat/Dispose).

State Acceptance

The State of Washington concurs with the selected remedy.

Community Acceptance

No modification to the remedy was necessary as a result of public comment. Public comments received are located in the Responsiveness Summary (Appendix B).

RCRA Corrective Action Performance Standards

The RCRA corrective action performance standards of Washington Administrative Code (WAC) 173-303-646(2) state that corrective actions must:

- Protect human health and the environment for all releases of dangerous wastes and dangerous constituents, including releases from all solid waste management units.

- Be required regardless of the time at which waste was managed at the facility or placed in such units and regardless of whether such facilities or units were intended for the management of solid or dangerous waste.

- Be implemented by the owner/operator beyond the facility property boundary where necessary to protect human health and the environment.

The RCRA corrective action performance standards will be achieved under the preferred CERCLA remedial action.

National Environmental Policy Act Evaluation

The regulations found in the *National Environmental Policy Act of 1969*(NEPA) require an evaluation of the environmental consequences of the remedial alternatives under consideration. Criteria used to compare alternatives include examination of potential effects on ecological, cultural, and historical resources; review of socioeconomic aspects; and identification of irreversible and irretrievable commitment of resources. The following summary compares how the remedial alternatives impact NEPA values.

The No Action, Institutional Controls, Containment, and In Situ Treatment alternatives would require irreversible and irretrievable commitment of natural resources by restricting availability of surface use of the sites. Cumulative impacts would occur at the borrow pit associated with the Containment alternative.

The Remove/Treat/Dispose alternative would result in an irreversible and irretrievable commitment of natural resources at the disposal unit (i.e., ERDF) and borrow sites used to obtain materials to fill the excavated sites and cover the ERDF. Excavation could disturb cultural resources located at a site, and careful adherence to cultural resource mitigation planning would be required. Excavation may also impact ecological resources. Cumulative impacts may occur at borrow sites and transportation routes.

Reactor Building Materials

The following information provides an analysis of the No Action alternative versus the ERDF Disposal alternative evaluated against the nine CERCLA criteria and NEPA requirements.

Overall Protection of Human Health and the Environment

The No Action alternative would not eliminate, reduce, or control risks to workers, the public, or the environment. Because this alternative does not meet the threshold criterion of protectiveness, it cannot be considered a viable alternative. The ERDF Disposal alternative provides for disposal in a unit that meets the substantive landfill requirements under RCRA. This unit is double-lined and includes leak detection and leachate collection systems.

Compliance with Applicable or Relevant and Appropriate Requirements

Key ARARs for removal and disposition of 100 Area reactor building materials include the substantive requirements of the dangerous waste management standards WAC 173-303. RCRA land disposal restrictions (40 *Code of Federal Regulations*[CFR] 268), low-level radioactive waste disposal requirements (10 CFR 61), transportation requirements (49 CFR 100-179), radiation protection standards (10 CFR 835), and air emission standards (40 CFR 61 and

WAC 246-247). The No Action alternative could result in eventual release of hazardous substances into the environment or cause human exposure to contaminants. The ERDF Disposal alternative can meet all ARARs associated with disposal of 100 Area reactor building material.

Long-Term Effectiveness and Permanence

The No Action alternative provides no controls for long-term effectiveness and permanence. The ERDF Disposal alternative would provide long-term effectiveness and permanence through disposal of contaminants in a unit designed for 500 years.

Reduction of Toxicity, Mobility, or Volume through Treatment

The No Action alternative does not reduce toxicity, mobility, or volume through treatment. The ERDF Disposal alternative would reduce the toxicity of contaminants in 100 Area reactor building waste through natural attenuation in the soil column, particularly through radioactive decay. The degree of treatment of materials required to meet waste acceptance criteria at either disposal unit would be similar.

Short-Term Effectiveness

The No Action alternative would not present short-term risks as no remedial alternatives would be conducted. The ERDF Disposal alternative would provide adequate short-term protection to human health and the environment. The primary risk to workers would be potential exposure to contaminants during waste handling, transport, and disposal. This risk would be mitigated by appropriate training, personal protective equipment, and waste-handling practices. Either alternative could be implemented immediately.

Implementability

The No Action alternative could be implemented within a short time period and would not present any technical problems; however, this alternative would not be consistent with DOE's long-range goals for the decontamination and decommissioning of the Hanford Site reactor buildings. The ERDF Disposal alternative is immediately implementable. The ERDF ROD was modified in 1996 by an Explanation of Significant Difference, which stated that decontamination or decommissioning waste, such as 100 Area reactor building material, may be disposed in the ERDF in accordance with a remedial action ROD or removal action memoranda.

Cost

No costs are associated with the No Action alternative. The volume of waste is estimated to be 2,045 cubic yards. Costs for disposal at the ERDF are $ 172,000 for transportation and disposal of low-level waste, mixed waste, hazardous waste, and asbestos. For transportation and offsite treatment and disposal of liquid PCBs, the estimated cost is $ 24,000. Therefore, the total cost for the ERDF Disposal alternative is $196,000.

State Acceptance

The State of Washington concurs with the selected remedy.

Community Acceptance

The community acceptance modifying criterion was implemented after all public comments on the proposed plan were received. No modification to the remedy was necessary as a result of public comment.

National Environmental Policy Act Values

The No Action alternative would continue to present a risk of direct exposure to both human and ecological receptors. No direct cumulative impacts would result from this alternative. Cumulative impacts from the ERDF Disposal alternative are not expected to occur due to the relatively low volumes of waste (relative to other Hanford Site waste-generating activities) requiring disposal. This alternative would not be expected to significantly affect natural or cultural resources. No new facilities require construction. The work force required for disposal of the wastes would be small and would be drawn from existing work force resources. Socioeconomic impacts from either of the alternatives would be minimal.

XI. SELECTED REMEDY

The components of the selected remedy achieve the best balance of the nine evaluation criteria described above.

The selected remedy for 100 and 200 Areas waste sites will include the following activities:

- Per the Tri-Party Agreement, DOE is required to submit the remedial design report, remedial action work plan, and sampling and analysis plan as primary documents. These documents and associated documents concerning the planning and implementation of remedial design and remedial action shall be submitted to EPA and Ecology for approval prior to the initiation of remediation. The current remedial design report and remedial action work plan may be revised as an alternative to submitting new documents.

- Removing and stockpiling any necessary uncontaminated overburden will involve, to the extent practicable, that this material will be used for backfilling excavated areas.

- Excavation activities will follow standard construction practices for excavation and transportation of hazardous materials and will follow as low as reasonable achievable (ALARA) practices for remediation workers. Dust suppression during excavation, transportation, and disposal will be required, as necessary.

- C Treatment, as necessary to meet ERDF waste acceptance criteria will be preformed in the 100 Area or at the ERDF prior to disposal. Recycling of treated materials and re-use of treated materials for backfilling excavated areas are expected to reduce remedial action costs. Materials that are transported to ERDF for disposal must meet the disposal acceptance criteria, including treatment provisions, for that facility.

- C As discussed in previous sections, the extent of remediation of the waste sites will take into account certain site-specific factors. The waste sites are represented by the following two general categories and the primary factors for consideration are discussed for each:

  - S For shallow sites where the entire engineered structure, soil, or debris contamination is present within the top 4.6 m (15 ft), RAOs will be achieved when contaminant levels are demonstrated to be at or below MTCA Method B for inorganics and organics for residential exposure and the 15 mrem/yr residential dose level and are at levels that provide protection of groundwater and the Columbia River.

  - S For sites where the engineered structure and/or contaminated soil and debris begins above 4.6 m (15 ft) and extends to below 4.6 m (15 ft), the engineered structure (at a minimum) will be remediated to achieve RAOs so the contaminant levels are demonstrated to be at or below MTCA Method B levels for metals and organics for exposure and the 15 mrem/yr residential dose level and are at levels that provide protection of groundwater and the Columbia River. Any residual contamination present below the engineered structure and is greater than 4.6 m (15 ft) in depth shall be subject to several factors in determining the extent of remediation including reduction of risk by decay of short-lived radionuclides (half-life of less than 30.2 years) protection of human health and the environment, remediation costs, sizing of the ERDF, worker safety, presence of ecological and cultural resources, the use of institutional controls, and long-term monitoring costs. The extent of remediation must ensure that contaminant levels remaining in the soil are protective of groundwater and the Columbia River. For nonradioactive contaminants MTCA specifies that concentrations of residual contaminants are protective of groundwater at levels equal to or less than the 100 times the groundwater cleanup levels established in accordance with WAC 173-340-720. If residual concentrations exceed cleanup levels calculated using the 100 times rule , site specific modeling will be preformed to provide refinement on contaminants found to simulate actual conditions at the waste site. For radionuclides, groundwater and river protection will be demonstrated through a technical evaluation using the computer model Residual Radioactivity (RESRAD). The application of the criteria for the balancing factors will be made by EPA, Ecology, and DOE on a site-by-site basis. A public comment period of no less than 30 days will be required prior to makeing any determination to invoke balancing factors.

NOTE: The practice of placing clean fill over site to reduce exposure to radioactive contaminants has resulted in many of the sites, (e.g., trenches) being backfilled and shallow near-surface sites receiving additional clean fill above them. When considering the top 4.6 *m* (15 *ft*)*, such past practices shall not be taken into account; rather the grade at the time of disposal will be considered as the ground surface.*

C After a site has been demonstrated to have achieved cleanup levels and RAOs, the site will be backfilled with clean materials and revegetated in accordance with approved plans. Revegetation plans will be developed as part of remedial design activities with input from affected stakeholders such as Natural Resource Trustee and Native American Tribes. Revegetation efforts will attempt to establish a viable habitat at the remediated areas and will emphasize the use of native seed stock.

C Institutional controls and long-term monitoring will be required for sites where wastes are left in place and preclude an unrestricted land use. Institutional controls selected as part of this remedy are designed consistent with the interim action nature of this ROD. Additional measures may be necessary to ensure long-term viability of institutional controls if the final remedial actions selections for the 100 Area does not allow for unrestricted land use. Any additional controls will be specified as part of the ifnal remedy. The following institutional controls are required as part of this interim action:

1. DOE will continue to use a badging program to control access to the associated sites for the duration of the interim action. Visitors entering any of the sites associated with this Interim Action ROD are required to be escorted at all times.

2. DOE will utilize the onsite excavation permit process to control land use (e.g., well drilling or excavation of soil) within the 100 Area OUs.

3. DOE will maintain exisiting signs prohibiting public access.

4. DOE will provide notification to EPA and Ecology upon discovery of any trespass incidents.

5. Trespass incidents will be reported to the Benton County Sheriff's Office for investigation and evaluation for possible prosecution.

6. DOE will take the necessary precaustions to add access restriction language to any land transfer, sale, or lease of property that the U.S. Government considers appropriate while institutional controls are compulsory.

7. Until final remedy selection, DOE shall not delete or terminate any institutional control requirement established in this Interim Action ROD unless EPA and Ecology have provided written concurrence on the deletion or termination and appropriate documentation has been placed in the Administrative Record.

8. DOE will evaluate the implementation and effectiveness of institutional controls for the 100 Area Ous on an annual basis. The DOE shall submit a report to EPA and Ecology by March 30 of each year summarizing the results of the evaluation for the preceding calendar year. At a minimum, the report shall contain an evaluation of whether or not the institutional control requirements continue to be met and a description of any deficiencies discovered and measures taken to correct problems.

C Because this is an interim action and wastes will continue to be present in the 100 Area until such time as a final ROD is issued and final remediation objectives are achieved, a 5-year review will be required.

Based on the evaluation of CERCLA criteria and NEPA values, the preferred alternative for 100 Area reactor building waste is removal, treatment as required, packaging, transport, and disposal of the waste at the ERDF. The ERDF Disposal alternative minimizes disposal costs while providing a higher degree of protectiveness and effectiveness than would be provided through implementation of the No action alternative.

XII. STATUTORY DETERMINATIONS

Under CERCLA Section 12 1, selected remedies must be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that significantly and permanently reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. This section discusses how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy protects human health and the environment through interim remedial actions to reduce or eliminate risks associated with exposure to contaminated soils, structures, and debris. Implementation of this remedial action will not pose unacceptable short-term risks to site workers that cannot be mitigated through acceptable remediation practices. Removal of contaminated soils, structures and debris will prevent exposure under future land-use scenarios.

The qualitative risk assessment for a residential scenario associated with radionuclides at waste sites under this interim action estimated risks greater than 1×10^{-3}. The qualitative risk assessment for a recreational scenario associated with radionuclides at waste sites under this action also estimated risks eater than 1×10^{-3}. Remediation of sites will principally occur to remove radioactive contaminated soils. structures, and debris. The incremental residual risks after implementation this remedy is estimated at 3×10^{-4} (residential scenario) for exposure to radionuclides. For inorganics and organics the residual risk is expected to be 1×10^{-6} or lower. It is expected that inorganics and organics, due to co-location with radionuclides, will be remediated to levels at or below MTCA levels during the course of implementation of the interim remedial actions.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with the federal and state APAR's identified below. No waiver of any APAR is being sought. The APARs identified for the 100 Area source OUs include the following:

- The SDWA MCLs for public drinking water supplies are relevant and appropriate for protecting groundwater.

- MTCA (WAC 173-340) risk-based cleanup levels are applicable for establishing cleanup levels for soil, structures and debris.

- *Clean Water Act*, (3.3) U.S.C. 125 1) requirements for protection of aquatic life are relevant and appropriate for protecting the Columbia River.

- "Water Quality Standards for Waters of the State of Washington" WAC 173-201-035, are applicable for protecting the Columbia River.

- "National Emission Standards for Hazardous Air Pollutants" (40 CFR 6 1), are applicable for radionuclide emissions from facilities owned and operated by DOE. Radionuclides are presented in the contaminated soils, structures, and debris that will be excavated, treated, transported, and disposed under this interim action.

- State of Washington "Dangerous Waste Regulations," (WAC 173-303), are applicable for the identification, treatment, storage, and land disposal of hazardous and dangerous wastes.

- RCRA Subtitle C (40 CFR 261, 264, 268) is applicable for the identification, treatment, storage, and land disposal of hazardous wastes.

- "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials" (49 CFR 100 to 179), will be applicable for any wastes that are transported offsite.

- *Hazardous Materials Transportation Act*(49 U.S.C. 1801-1813) is applicable for transportation of potentially hazardous materials, including samples and wastes.

- “Minimum Standards for Construction and Maintenance of Wells” (WAC 173-160 and 162), applicable regulations for the location, design, construction, and abandonment of water supply and resource protection wells.

- *Water Quality Standards for Waters in the State of Washington* (WAC 173-200) are relevant and appropriate for establishing for establishing cleanup goals that are protective of the Colombia River.

- “RCRA Standards for Miscellaneous Treatment Units” (40 CFR 264, Subpart X). Contains substantive requirements of this are relevant and appropriate to the construction, operation, maintenance, and closure of any miscellaneous treatment unit (e.g., thermal desorption unit) constructed in the 100 Area for treatment of hazardous wastes.

- “RCRA Standards for Tank Systems Units” (40 CFR 264, Subpart J) contains substantive requirements that are relevant and appropriate to the construction, operation, maintenance and closure of any tank units associated with soil washing, treatment units constructed in the 100 Area for treatment of hazardous wastes.

- *Toxic Substances Control Act* (15 U.S.C. 2601, implemented via 40 CFR 761) is applicable to the management and disposal of remediation waste containing regulated concentrations of PCBs, including specific requirements for PCB remediation waste.

- State of Washington, “Department of Health” (WAC 246-247) is applicable to the release of airborne radionuclides.

- *National Archeological and Historical Preservation Act* (16 U.S.C. 469) 36 CFR 65) is relevant and appropriate to recover and preserve artifacts in areas where an action may cause irreparable harm, loss, or destruction of significant artifacts.

- *National Historic Preservation Act* (16 U.S.C. 470; 36 CFR 800) is relevant and appropriate to actions in order to preserve historic properties controlled by a Federal agency.

- *Endangered Species Act of 1973* (16 U.S.C. 1531; 50 CFR 200; 50 CFR 402) is relevant and appropriate to conserve critical habitat upon which endangered or threatened species depend. Consultation with the Department of the Interior is required.

Other Criteria, Advisories, or Guidance to be Considered for this Remedial Action (TBCs)

- The ERDF waste acceptance criteria (Rev. 3) delineate primary requirements, including regulatory requirements, specific isotopic constituents and contamination levels, the dangerous/hazardous constituents and concentrations, and the physical, chemical waste characteristics that are acceptable for disposal of wastes at the ERDF.

- 59 FR 66414, " Radiation Protection Guidance for Exposure to the General Public," contains EPA protection guidance recommending (non-medical) that radiation doses to the public from all sources and pathways not exceed 100 mrem/yr above background. It also recommends that lower dose limits be applied to individual sources and pathways. One such individual source is residual environmental radiation contamination after the cleanup of a site. Lower doses limits and individual pathways are referred to as secondary limits.

- *The Future For Hanford: Uses and Cleanup, The Final Report of the Hanford Future Site Uses Working Group*, December 1992.

Cost Effectiveness

The selected remedy provides overall effectiveness proportional to its cost. In addition, the use of the observational and plug-in approaches will ensure that a protective remedy is implemented, and will result in savings relative to the time and money required to evaluate and select and implement remedies on a site-by-site basis, as well as through combining aspects of characterization with remediation.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for these sites. The selected remedies provide the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability, and cost while considering the statutory preference for treatment as a principal element and considering state and community acceptance.

Preference for Treatment as a Principal Element

The selected remedy utilizes treatment, as appropriate, to meet ERDF waste disposal criteria.

Onsite Determination

The preamble to the NCP states that when noncontiguous facilities are reasonably close to one another and the wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without obtaining a permit. The 100 Area NPL sites addressed by this Interim Action ROD area reasonably close to the ERDF and are compatible for disposal at the ERDF; therefore, these sites and the ERDF are considered to be a single site for the purposes of this Interim Action ROD.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

The Tri-Parties have reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the selected remedy, as originally identified in the proposed plan, were necessary.

Table 1. Look-Up Values Summary: Contaminant-Specific Cleanup Levels. (2 Pages)

Contaminant	First Remedial Action Objective - Protection from Direct Exposure		Second Remedial Action Objective - Protection of Groundwater/Columbia River		Look-Up Values Summary	
	Remedial Action Goal for Nonradionuclides (mg/kg)	Remedial Action Goal for Radionuclides (pCi/g)	Contaminant-Specific Concentration in Soil Protective of Groundwater (pCi/g or mg/kg)	Contaminant-Specific Concentration in Soil Protective of the Columbia River (pCi/g or mg/kg)	Remedial Action Goal - Shallow Zone (< 4.6 m [15 ft])[a]	Remedial Action Goal - Deep Zone (> 4.6 m [15 ft])[b,c]
Americium-241	NA	31.1	1,577,000	1,577,000	31.1	1,577,000
Cesium-137	NA	6.2	d	d	6.2	NA
Cobalt-60	NA	1.4	d	d	1.4	NA
Europium-152	NA	3.3	d	d	3.3	NA
Europium-154	NA	3.0	d	d	3.0	NA
Europium-155	NA	125	d	d	125	NA
Nickel-63	NA	4,026	d	d	4,026	NA
Plutonium-238	NA	37.4	1,123	1,123	37.4	1,123
Plutonium-239/240	NA	33.9	718,600	718,600	33.9	718,600
Strontium-90	NA	4.5	d	d	4.5	NA
Technetium-99	NA	15	15[e]	15[e]	15[e]	15[e]
Thorium-232	NA	1.3	d	d	1.3	NA
Tritium (H-3)	NA	510	35.5	106.7	35.5	35.5
Uranium-233/234	NA	1.1	1.1[f]	1.1[f]	1.1[f]	1.1[f]
Uranium-235	NA	1.0	1.0[e]	1.0[e]	1.0[e]	1.0[e]
Uranium-238	NA	1.1	1.1[f]	1.1[f]	1.1[f]	1.1[f]
Antimony	32	NA	6.0[e]	6.0[e]	6.0[e]	6.0[e]
Arsenic	6.5[f]	NA	6.5[f]	6.5[f]	6.5[f]	6.5[f]
Barium	5,600	NA	d	d	5,600	NA
Cadmium	80	NA	d	d	80	NA
Chromium (III)	80,000	NA	d	d	80,000	NA

Table 1. Look-Up Values Summary: Contaminant-Specific Cleanup Levels. (2 Pages)

Contaminant	First Remedial Action Objective - Protection from Direct Exposure		Second Remedial Action Objective - Protection of Groundwater/Columbia River		Look-Up Values Summary	
	Remedial Action Goal for Nonradionuclides (mg/kg)	Remedial Action Goal for Radionuclides (pCi/g)	Contaminant-Specific Concentration in Soil Protective of Groundwater (pCi/g or mg/kg)	Contaminant-Specific Concentration in Soil Protective of the Columbia River (pCi/g or mg/kg)	Remedial Action Goal - Shallow Zone (< 4.6 m [15 ft])[a]	Remedial Action Goal - Deep Zone (> 4.6 m [15 ft])[b,c]
Chromium (VI)	400	NA	8.0	2.2	2.2	2.2
Lead	353	NA	d	d	353	NA
Manganese	11,200	NA	d	d	11,200	NA
Mercury	24	NA	d	d	24	NA
Zinc	24,000	NA	d	d	24,000	NA
Polychlorinated Biphenyls	0.5	NA	d	d	0.5	NA
Benzo(a)pyrene	0.33[e]	NA	d	d	0.33[e]	NA
Chrysene	0.33[e]	NA	d	d	0.33[e]	NA
Pentachlorophenol	8.33	NA	d	d	8.33	NA

[a] In the shallow zone, cleanup must achieve the direct exposure remedial action objective (RAO) and the groundwater/Columbia River RAO, therefore, the lowest value among the "Protection from Direct Exposure," "Protective of Groundwater," and "Protective of the Columbia River" values is the applicable look-up value.

[b] In the deep zone, cleanup must achieve the groundwater/Columbia River RAO; therefore, the lowest value between the "Protective of Groundwater" and the "Protective of the Columbia River" values is the applicable look-up value.

[c] Deep zone remedial action goals are not applicable for protection from direct exposure to radionuclides because a potentially exposed individual in a basement is protected from gamma radiation by 0.9 m (3 ft) of soil and a concrete floor.

[d] The RESRAD model predicts the contaminant will not reach groundwater within a 1,000-year time frame.

[e] The remedial action goal is below the practical quantitation limit (PQL). The value presented is the PQL.

[f] The remedial action goal is below background. The value presented is background.

Values in the table are lookup values based on the generic site model. Site-specific remedial action goals will be calculated for site close-out verification using site-specific information.

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY a)	Estimated Cost of Site Remediation
100-HR-1 (CERCLA site-EPA lead)	116-H-7 (1904-H1 Outfall Structure)	Received H Reactor process effluent for discharge to pipelines to the Columbia River. Site consists of an open concrete sump and a concrete spillway from the sump to the river shoreline. Currently enclosed with aviary exclusion wire and cyclone fence. Spillway has been covered with soil to an unknown depth. Outfall structure is 8.2 x 4.3 x 6.4 m deep (27 x 14 x 21 ft deep) (References: Carpenter 1994, DOE-RL 1992e, DOE-RL 1994e, EPA 1996)	Concrete, soil	Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90	494	$229,585
	128-H-1 (Coal Ash and Demolition Waste Site)	Formerly used for burning nonradioactive, combustible wastes and disposal of solid building demolition waste. Chemical-stained soil and stressed vegetation visible along the river banks. Vegetation-covered depression 137.2 x 18.3 m (450 x 60 ft). Operated 1944-1968. This site includes former waste site 600-57. (References: Carpenter 1994, DOE-RL 1992e, EPA 1996)	Soil, construction debris	Undetermined organic and inorganic chemicals	17,250	$2,056,748
	132-H-6 (1904-H2 Outfall Structure)	Received H Reactor effluent for discharge to effluent pipelines to the Columbia River. Concrete outfall structure and spillway reduced to grade and covered with clean soil. Underground 1.7-m (66-in) effluent discharge line remains in place. Operated 1954-1969. Surface radionuclide contamination is reported to be present. Site is 8.2 x 4.3 m (27 x 14 ft); total depth assumed to be 6.4 m (21 ft); overburden depth unknown. (References: Carpenter 1994, DOE-RL 1992e, 1994e, EPA 1996)	Concrete, soil	Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90	446	$226,298
	132-C-2 (1904-C Outfall Structure)	Received C Reactor effluent and process sewer effluent for discharge effluent pipelines to the Columbia River. Concrete outfall structure and spillway reduced to grade and covered with clean soil. Operated 1952-1969. Surface radionuclide contamination is reported to be present. Site is 16 x 8.2 x 6.4 m deep (52 x 27 x 21 ft deep), overburden depth unknown. (References: Carpenter 1994; DOE-RL 1992e, 1994e, EPA 1996)	Concrete, soil	Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90	1,536	$199,619
100-DR-1 (CERCLA site-EPA lead)	100-D-1 (Contaminated Storm Drain)	Received radioactive and hazardous liquid waste leakage from 116-D-7 (107-D) retention basin. Site is a concrete storm drain system, 1 x 1 m (3.3 x 3.3 ft) box (depth unknown) covered with steel plate. It is attached to underground 22.5-cm (9-in.) piping running from the south side of the patrol road to the 1904-D Outfall. (References: Carpenter 1993, EPA 1996)	Concrete, steel, soil	Undetermined radionuclides (beta and gamma)	75	$151,201
	100-D-2 (Lead Sheeting)	Lead sheeting was not removed from concrete pad when pad was buried during demolition of 190-D Building in 1995. Located near the 190-D Annex, 1.2 x 1.2 m (4 x 4 ft). Purpose unknown. (References: Carpenter 1994, EPA 1996)	Lead, concrete	Pb	1	$19,298
	100-D-3 (Silica Gel Burial Site)	Received silica gel from the 115-D/DR drying towers. May also be the site of the 100-D Pluto Crib. Potentially contaminated with radioactive and hazardous materials. Site is in a vegetation-free graveled lot, site dimensions are unknown. (References: Carpenter 1993, EPA 1996)	Soil, silica gel	C-14, radionuclides, inorganic, organic chemicals	477	$188,527

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY [a])	Estimated Cost of Site Remediation
100-DR-1 (cont.)	100-D-19 (Sludge Trench near 116-D-7)	Received reactor process effluent containing radioactive and hazardous contaminants from the 116-D-7 (107-D) retention basin during fuel cladding failures. Dimensions unknown. (References: Carpenter 1993, DOE-RL 1992b, WHC 1993)	Soil	Co-60, Cs-137, Eu-152, Eu-155, U-238, Cr VI	8,202	$1,075,555
	100-D-31 (Process Sewer System)	Carried water treatment waste and rainwater runoff to outfall 116-D-5 until 1977. The process sewer drainage was diverted solely to the 120-D-1 100-D Ponds from 1977 to 1994. Site does not include process sewer for reactor facilities or reactor process effluent. Dimensions unknown. (Reference: WIDS)	Concrete, steel, soil	Cr, Hg, undetermined radionuclides and organic chemicals	5,547	$2,386,452
	116-D-5 (1904-D Outfall Structure)	Received reactor process effluent from the 116-D-7 retention basin from 1944 to 1975. Also received process waste water from 183-D, 184-D, 190-D, 185/189-D, and other miscellaneous facilities. Located 122 m (400 ft) west of the 116-D-7 retention basin on the bank of the Columbia River. The structure is 18.3 x 7.3 m (60 x 24 ft); depth unknown. (References: Carpenter 1993; DOE-RL 1992b, 1994g; EPA 1996, WHC 1993)	Concrete, steel, soil	C-14, Cs-137, Sr-90, U-235, U-238, Pu-239/240, undetermined inorganic chemicals	1,633	$391,615
	116-DR-5 (1904-DR Outfall Structure)	Received reactor process effluent from the 116-DR-9 retention basin. Located 91 m (300 ft) north of the northwest corner of the 107-D retention basin. Structure is 8.2 x 4.3 m (27 x 14 ft); depth unknown. (References: Carpenter 1993; DOE-RL 1992b, 1994g; EPA 1996; WHC 1993)	Concrete, steel, soil	C-14, Cs-137, Sr-90, U-235, U-238, Pu-239/240, undetermined inorganic chemicals	442	$213,890
	120-D-2 (186-D Waste Acid Reservoir)	Designated as a waste site because lead flashing was not removed when the facility was demolished in place in 1979. Located at the northeast corner of the 186-D Building; 28 x 28 x 4 m deep (92 x 92 x 14 ft deep) pit constructed of acid proof brick, waterproof membrane, vitrified pipe, #8 lead flashing, and gunnite. Facility never used (no records found to document use) (References: Carpenter 1993, EPA 1996)	Brick, lead	Pb	7,022	$2,058,138
100-DR-2 (RCRA site - Ecology lead)	100-D-12 (Sodium Dichromate and Acid Unloading Station)	Received sodium dichromate and sulfuric acid solutions in water from flushing and draining of hoses and pipelines connected to railcars and trucks for unloading. Test pits during the 100-DR-2 Limited Field Investigation (LFI) (DOE-RL 1995e, p. D-78) found chromium VI and radionuclides above Hanford Site background. Dimensions unknown. Has adjacent 0.9-m- (3-ft) diameter french drain. (References: Carpenter 1993, DOE-RL 1995e)	Concrete, steel, soil	Cs-137, Eu-152, Th-228, Sulfate, Cr VI	579	$196,177
	116-D-8 (100-D Cask Storage Pad)	Concrete pad and two associated French drains contaminated by radionuclides, potassium borate, and other inorganic chemicals. Dimensions unknown. (References: Carpenter 1993, EPA 1996)	Concrete, steel, soil	Cs-137, Eu-152, Th-228, U-238	5,957	$902,645

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY[a])	Estimated Cost of Site Remediation
100-DR-2 (cont.)	116-DR-7 (Inkwell Crib)	Received liquid potassium borate solution contaminated with radionuclides. Site is 1.5 x 1.5 x 3 m deep (5 x 5 x 10 ft deep). One or two 2,082-L (550 gal) storage tanks may also be buried at the site. (References: Carpenter 1993, EPA 1996)	Soil	Cs-137, Eu-152, Th-228, U-238	163	$146,689
100-FR-1 (CERCLA site - EPA lead)	116-F-8 (1904-F Outfall Structure)	Received reactor process effluent from the 116-F-14 retention basin. Demolished concrete structure formerly 8.2 x 4.3 x 7.9 m deep (27 x 14 x 26 ft deep). Area is marked with underground radioactive contamination warning signs. Lower part of spillway is exposed and intact. (References: Deford 1991, DOE-RL 1992a, 1994d, EPA 1996)	Concrete, soil, steel	Co-60, Eu-152, Eu-154, Eu-155	402	$230,601
	116-F-15 (108-F Radiation Crib)	Concrete sump in the ground floor of the 108-F Radiobiology Laboratory. Received drainage from lab floor and hood drains. Sump is 0.9 x 0.9 x 0.9 m deep (3 x 3 x 3 ft deep). (References: Deford 1991, Harris 1996)	Concrete, steel	Pu-239/240, Sr-90, U-238, Pb	2	$20,193
	116-F-16 (PNL Outfall)	Concrete spillway connected to the 116-F-8 Outfall, which received waste water from the 100-F-29 FAE sewers. Most of the spillway has been backfilled, but a portion near the river shoreline is visible. Dimensions are 30.5 x 4.6 m (100 x 15 ft). (References: Deford 1991, DOE-RL 1992a, 1994d, EPA 1996)	Concrete, steel, soil	Cs-137, Pu-239/240, Sr-90	891	$112,063
	1607-F2 (Septic tank and drain field)	Received sanitary wastes from the 190-F, 105-F, 108-F, and other buildings. Marked with underground radioactive material warning signs. Reinforced concrete septic tank is 8.1 x 3.5 x 4.1 m deep (27 x 12 x 14 ft deep), drain field is 3,107 m^2 (33,408 ft^2). (References: Deford 1991, EPA 1996)	Concrete, tile, pipe, soil	Undetermined radionuclides	24,332	$2,825,821
	1607-F6 (1211-F-6 Septic tank and drain field)	Received sanitary sewage from the 116-F and 146-FR Buildings. Site contains of two concrete tanks (each 0.9 m [3 ft] long by 0.9 m [3 ft] diameter), a steel tank 1.9 m (6.25 ft) long by 1.83 m (6 ft) diameter, a drain field, and pipelines. The drain field is 280 m^2 (3,000 ft^2). (References: Deford 1991, EPA 1996)	Concrete, metal, tile, soil	Undetermined organic and inorganic chemicals	2,157	$385,893
100-FR-2 (CERCLA site - EPA lead)	100-F-2 (Strontium Gardens)	PNL ecological study garden formerly used for growing plants in soils containing radionuclides. Site is completely enclosed by a 24 x 9 x 3 m tall (80 x 30 x 10 ft tall) screen structure. (References: Deford 1991, DOE-RL 1995a [Appendix I], 1995c, EPA 1996)	Soil	Cs-137, Sr-90	2,011	$114,521
	120-F-1 (Glass Dump)	Site is an open trench, 10.7 x 2.4 x 1.2 m deep (35 x 8 x 4 ft deep) containing approximately 0.6 m (2 ft) of fluorescent tubes, light bulbs, vacuum tubes, small batteries, and empty chemical bottles. (References: Deford 1994, DOE-RL 1995a [Appendix I], 1995c; EPA 1996)	Debris, soil	Undetermined inorganic chemicals	48	$130,139

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY [a])	Estimated Cost of Site Remediation
100 HR-1 (CERCLA site - EPA lead)	100-H-11 (Expansion Box French Drain E)	The site is a french drain inside a concrete expansion box next to the south wing of the 105-H Reactor. A 1.5-m- (5-ft) diameter effluent line makes a 40-degree turn in the box, and the drain was designed to drain any leaks from the pipe. Dimensions unknown. (References: Deford and Einan 1995, EPA 1996)	Concrete, soil, steel	Undetermined radionuclides	72	$153,712
	100-H-12 (Expansion Box French Drain F)	The site is a french drain inside a concrete expansion box next to the 105-H Reactor. A 1.5-m- (5-ft) diameter effluent line makes a 90 degree turn in the box, and the drain was designed to drain any leaks from the pipe. The manhole access to the box is blocked with lead bricks to shield from a high dose. Dimensions unknown. (References: Deford and Einan 1995, EPA 1996)	Concrete, soil, steel, lead	Pb, undetermined radionuclides	72	$153,712
	100-H-13 (French Drain G)	The site is a 1.2-m- (4-ft) diameter vitrified clay pipe with a 6.3-cm (2.5-in.) steel pipe entering from the 105-H Reactor. The purpose of the drain and pipe are not known. (References: Deford and Einan 1995, EPA 1996)	Vitrified clay, steel	Undetermined radionuclides	72	$153,712
	100-H-14 (Surface contamination Zone H)	Surface contamination zone of unknown origin next to the south wall of the 105-H Reactor Building fuel storage basin. Contamination was stabilized with 46 to 61 cm (18 to 24 in.) of soil and marked as subsurface contamination. The source of the contamination and dimensions of the contaminated area are unknown. (References: Deford and Einan 1995, EPA 1996)	Soil	Undetermined radionuclides	1,022	$256,644
	100-H-22 (Effluent Pipeline Leak)	Soil at this site was contaminated by leakage from the 105-H Reactor process effluent pipeline. Sampling in 1971 showed radioactivity of the soil was less than detection levels. Dimensions unknown. (References: Deford and Einan 1995; DOE-RL 1992c, 1993b, EPA 1996)	Soil	Co-60, Eu-152, Cr VI	4,153	$656,276
	100-H-24 (151-H Substation, Laydown Yard)	Sampling of stained soil in 1991 showed polychlorinated biphenyl levels below Toxic Substances Control Act cleanup levels (seven samples). The site is described in WIDS as a demolition landfill from the demolished 151-H electrical substation. Site dimensions are 125 x 84 x 3.4 m deep (410 x 276 x 11 ft deep) (References: DOE-RL 1993b, EPA 1996)	Soil	PCBs	532	$183,555
	100-H-31 (PCB in soil at 105-H Reactor)	Sampling of stained oil in 1991 at this former location of an electrical substation found 1,200 ug/kg of Aroclor-1260 in one soil sample. Dimensions of the waste site are unknown. (References: DOE-RL 1993b, EPA 1996)	Soil	PCBs	72	$153,712
	116-H-5 (1904-H Outfall Structure)	Received H Reactor process effluent for discharge to pipelines to the Columbia River. This site is a former concrete structure that was demolished in place. Dimensions of the structure were 8.2 x 4.3 m (27 x 14 ft); depth unknown. Site is covered with 3 m (10 ft) of soil. (References: Deford and Einan 1995; DOE-RL 1992c, 1993b, EPA 1996)	Concrete, steel, soil	Co-60, Sr-90, Cs-137, Eu-152, Eu-154, Pu-239/240, Cr VI	193	$173,706

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY *)	Estimated Cost of Site Remediation
100-HR-1 (cont.)	116-H-9 (117-H Crib for drainage of Filter Building Seal Pits)	Gravel-filled crib 6.1 x 6.1 x 4.6 m deep (20 x 20 x 15 ft deep) that received drainage from the 117-H Filter Building seal pits. Drainage entered through an 80 m (263 ft) long 10.2-cm (4-in.) cement-asbestos pipe. Crib received short lived radionuclides that have decayed. Site was released from radiation controls in 1967, and the 100-HR-1 LFI (DOE-RL 1993b) concluded that the site was "a clean site." However, the crib remains listed as a Class V underground injection well. (References: Deford and Einan 1995, DOE-RL 1992c, 1993b, EPA 1996)	Soil, concrete asbestos	Cs-137, Eu-152, Ra-226, Th-228, Th-232, U-238	83	$149,018
	1607-H2 (Septic Tank and Drain Field)	Received sanitary sewage from the 182-H, 183-H, 190-H, and all 1700 maintenance service buildings. Concrete septic tank reported to be 12.2 x 3 x 2.5 m deep (40 x 10 x 8.3 ft deep); drain field is 91.5 x 30.5 m (300 x 100 ft). Septic tank sludge samples showed elevated heavy metal concentrations. (References: Deford and Einan 1995, DOE-RL 1993b, EPA 1996)	Soil, concrete, tile	Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Zn, Sulfate, Co-60, Cs-137, Eu-152, Ra-226, Th-228, Th-232	21,858	$2,556,444
	1607-H4 (Septic Tank and Drain Field)	Received sanitary sewage from the 181-H River Pumphouse. The size and construction material are unknown, a 1990 ground penetrating radar survey showed underground pipes that ended abruptly, without detecting a septic tank. LFI sampling showed heavy metal contamination around the discharge pipe to the former septic tank. Tank is believed to have been 1.2 x 0.6 x 2.5 m deep (4 x 2 x 8 ft deep). The drain field is believed to be 36 m² (384 ft²). (References: Deford and Einan 1995, DOE-RL 1993b, EPA 1996)	Soil	Ba, Cu, Pb, Zn, Cs-137, Eu-152, Ra-226, Th-228, Th-232, U-233/234, U-238	2,607	$428,422
100-KR-1 (CERCLA site-EPA lead)	116-K-3 (1904-K Outfall Structure)	Formerly received KE and KW Reactor process effluent for discharge to pipelines to the Columbia River. Currently regulated by a U.S. EPA NPDES outfall permit to discharge clean process cooling water and water treatment effluent to the Columbia River. The outfall structure is a reinforced concrete water box with attached spillway 10 x 10.7 x 7 m deep (33 x 35 x 23 ft deep). (References: Deford and Einan 1995; DOE-RL 1992c, 1993b, EPA 1996)	Concrete, steel, soil	Co-60, Sr-90, Cs-137, Eu-152, Eu-154, Pu-239/240	2,098	$551,904
100-KR-2 (CERCLA site-EPA lead)	100-K-11 (181-KE Acid Neutralization Pit and Overflow Trench Drain)	Received sulfuric acid overflow from the 183-KE day-use acid tank. The excavation for the drain was 1.5 m (5 ft) wide, 4.6 m (15 ft) deep. It was filled with aggregate to 17.5 cm (7 in.) from the top and covered with a limestone layer 12.5 cm (5 in.) deep. The steel cover of the pit is west of the alum storage tanks, south of the southwest corner of the 183-KE water treatment plant chlorine storage building. (Reference: Carpenter and Cote 1991)	Soil	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	78	$154,462
	100-K-18 (183-KW Caustic Neutralization Pit)	The site is a lined pit used to neutralize caustic solutions before disposal to the process sewer system. The pit is a 2.5 x 2 x 0.9 m deep (8.3 x 6.3 x 3 ft deep) brick-lined concrete box located 2.4 m (8 ft) southwest of the sulfuric acid tank at the 183-KW water treatment plant. (References: Carpenter and Cote 1991, DOE-RL 1991a)	Concrete, brick	As, Ba, Cd, Cr, Pb, Hg, Ag, Se	15	$115,472

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY [a])	Estimated Cost of Site Remediation
100 KR-2 (cont.)	100-K-14 (183 KW Acid Neutralization Pit)	Received sulfuric acid tank transfer and overflow waste for neutralization before draining to the process sewer. The pit is a 2.5 x 2 x 1.5 m deep (8.3 x 6.3 x 5 ft deep) brick-lined concrete box located adjacent to the west outside wall of the 183-KW water treatment plant building and just north of the chlorine storage building. (References: Carpenter and Cote 1994, DOE-RL 1994a)	Concrete, brick	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	22	$117,014
	100-K-42[a] (105-KE Fuel Storage Basin)	The site is the fuel storage basin for the 105-KE Reactor. Although the basins originally served the K Reactors, N Reactor spent nuclear fuel was accumulated in the K basins from 1979 through 1987. Approximately 2,100 metric tons of spent nuclear fuel remain in the K Basins. A portion of the fuel elements in the 105-KE fuel storage basin and the concrete of the basin walls have degraded leaving sludge, fuel particles, and debris which must be removed before remediation of this site can occur. (References: Carpenter and Cote 1994)	Concrete, soil	Co-60, Sr-90, Cs-137, Eu-152, Eu-154, Pu-239/240	6,719	$1,098,786
	100-K-43[a] (105-KW Fuel Storage Basin)	The site is the fuel storage basin for the 105-KW Reactor. Although the basins originally served the K Reactors, N Reactor spent nuclear fuel was accumulated in the K basins from 1979 through 1987. Approximately 2,100 metric tons of spent nuclear fuel remain in the K Basins. The fuel elements in the 105-KE fuel storage basin and the concrete of the basin walls have degraded leaving sludge, fuel particles, and debris which must be removed before remediation of this site can occur. (References: Carpenter and Cote 1994)	Concrete, soil	Co-60, Sr-90, Cs-137, Eu-152, Eu-154, Pu-239/240	2,009	$1,559,047
	100-K-51 (100-KE Glycol Underground Pipelines)	Underground 0.5- m- (1.5-ft) diameter steel supply and return pipelines that transported ethylene glycol solutions between the 150-KE heat recovery station (116-KE-5) and the 165-KE Powerhouse. Length of the two parallel pipes is approximately 300 m (1,000 ft) each. (References: Carpenter and Cote 1994, DOE-RL 1992d)	Steel, soil	Ethylene glycol	191	$745,078
	100-K-51 (100 KW Glycol Heat Recovery Underground Pipelines)	Underground 0.5-m- (1.5-ft) diameter steel supply and return pipelines that transported ethylene glycol solutions between the 150-KW heat recovery station (116-KW-4) and the 165-KW Powerhouse. The pipelines originate at 116-KW-4 and end at 165-KW Building north wall. Length of the two parallel pipes is approximately 300 m (1,000 ft) each. (References: Carpenter and Cote 1994, DOE-RL 1994e)	Steel, soil	Ethylene glycol	191	$745,078
	120-KE-1 (183-KE Filter Water Facility Dry Well)	Received sulfuric acid and sulfuric acid sludge for neutralization before draining to the process sewer system. The site is a brick-lined concrete box 2.5 x 2 x 1.5 m deep (8.3 x 6.3 x 5 ft deep) that contained crushed limestone. During the time this facility operated, sulfuric acid and sludge were contaminated with mercury. Identical to 120-KW-1. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Concrete, brick	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	22	$117,014

Table A-1. 100 Area Remaining Sites for Remove/Treat/Dispose. (7 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Volume for Disposal (LCY [a])	Estimated Cost of Site Remediation
	120-KE-2 (183-KE Filter Waste Facility French Drain)	French drain used from 1955 to 1971 for disposal of sulfuric acid sludge removed from sulfuric acid tanks. A 0.9-m- (3-ft) diameter, 1.8-m- (6-ft) long vitrified clay pipe was placed vertically in an excavation 4 m (13 ft) across and 3.4 m (11 ft deep). The bottom 0.3 m (1 ft) of the pipe and bottom 1.5 to 1.8 m (5 to 6 ft) of the excavation were filled with coarse rock. Identical to 120-KW-2. (References: Carpenter and Cote 1991, EPA 1996)	Soil, Clay Pipe	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	123	$160,115
	120-KW-1 (183-KW Filter Water Facility Dry Well)	Received sulfuric acid and sulfuric acid sludge for neutralization before draining to the process sewer system. The site is a brick-lined concrete box 2.5 x 2 x 1.5 m deep (8.3 x 6.3 x 5 ft deep) that contained crushed limestone. During the time this facility operated, sulfuric acid and sludge were contaminated with mercury. Identical to 120-KE-1. (References: Carpenter and Cote 1991, DOE-RL 1991a, 1995a [Appendix K], EPA 1996)	Concrete, brick	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	15	$115,472
100-KR-2 (cont.)	120-KW-2 (183-KW Filter Water Facility French Drain)	French drain used from 1955 to 1971 for disposal of sulfuric acid sludge removed from sulfuric acid tanks. A 0.9-m- (3-ft) diameter, 1.8-m- (6-ft) long vitrified clay pipe was placed vertically in an excavation 4 m (13 ft) across and 3.4 m (11 ft deep). The bottom 0.3 m (1 ft) of the pipe and bottom 1.5 to 1.8 m (5 to 6 ft) of the excavation were filled with coarse rock. Identical to 120-KE-2. (References: DOE-RL 1991a, EPA 1996)	Soil, Clay Pipe	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	123	$160,115
100-IU-6 (CERCLA site - EPA lead)	600-149 (Small Arms Range)	The site was used from the 1940s through the 1950s as a practice range for handguns, rifles, shotguns, machine guns, hand grenades, smoke bombs, and other small arms and incendiary devices. Rubble, wire, lead bullets, and transite piping remnants are scattered about the site. The area containing lead bullets measures approximately 92 x 6 x 1.5 m deep (300 x 20 x 5 ft deep). (References: Deford 1995, DOE-RL 1996)	Soil, lead, transite, misc. debris	Pb	1,278	$239,035
TOTALS: 16 Remaining Sites for Remove/Treat/Dispose					123,390	$25,859,176

NOTE: See 100 Area Source Operable Unit Focused Feasibility Study (DOE/RL-94-61), Appendix N, Section N5.0 for references cited throughout this table.

* This site is an active waste management unit where hazardous substances have been potentially released or a substantial threat of a release of a hazardous substance exists. While these units are currently in service in support of DOE project activities, they are planned to be taken out of service by DOE when the project mission for these units has been completed and addressed by the selected remedy specified in the 100 Area Remaining Sites Interim ROD.

[a] LCY = Loose Cubic Yards

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-BC-1 (CERCLA site - EPA lead)	100-B-3 (Former Hot Thimble Burial Ground)	Undocumented solid waste site. A highly contaminated vertical thimble was removed from the 105-B Reactor Building in 1952 and temporarily buried in a trench at this site. The thimble was later removed and taken to another burial ground. Radioactive and nonradioactive contaminants may remain in the unlined trench, which was approximately 30 x 7.6 x 6.1 m deep (100 x 25 x 20 ft deep) (References: Carpenter 1994, DOE-RL 1992e, EPA 1996)	Soil	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Eu-154, Cd, Hg, Pb, undetermined organic chemicals	$97,235
	100-B-5 (Effluent Vent Disposal Trench)	Site is result of leakage that occurred at a junction box for reactor effluent pipeline. This site is within the larger "Underground Radioactive Material" area extending the length of the effluent pipeline. The site is about 30 x 3 x 3 m deep (100 x 10 x 10 ft deep). (Reference: Carpenter 1994)	Soil	Undetermined radionuclides, Cr VI	$52,638
	100-B-10 (107-B Basin Leak and Warm Springs)	In February 1949 several warm springs were observed along the Columbia River below the 100-B Area Retention Basin. The springs were attributed to leaks in the 116-B-11 retention basin. Samples of the water in 1949 showed 4 nCi/L beta activity. Dimensions unknown. (Reference: DOE-RL 1992e)	Soil	Undetermined radionuclides, Cr VI	$52,638
	116-B-15 (Cleanout Percolation Pit)	Received treated water from the 105-B Fuel Storage Basin cleanup project. Contaminated water was processed through filters and an ion exchange system before discharge. Site is an open excavated pit 30.5 x 15.2 x 1.8 m deep (100 x 50 x 6 ft deep) with cobble and soil walls. (References: Carpenter 1994, DOE-RL 1992e)	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Cr VI	$49,203
	120-B-1 (Battery Acid Sump)	Site is a concrete-lined sump, cleaned in 1986, immediately adjacent to the 105-B Reactor Building. Sump was formerly used for disposal of waste battery acid, solvents, and ethylene glycol. Dimensions not stated. (References: Carpenter 1994, DOE-RL 1992e, EPA 1996)	Concrete, soil	Cr VI, Pb, Hg, ethylene glycol, undetermined organic chemicals	$64,663
	126-B-3 (184-B Coal Pit)	Solid waste site; Inert Landfill. Received non-hazardous, non-radioactive solid waste and demolition debris. Unlined pit 122 x 69 x 3 m deep (400 x 225 x 10 ft deep).	Concrete, soil	Lead (batteries)	$100,201
	128-B-2 (100-B Burn Pit No. 2)	Used for burning of nonradioactive, combustible wastes, including office wastes, paint, and chemical solvents. Unlined pit 137.2 x 15.2 x 9.1 m deep (450 x 50 x 30 ft deep). (References: Carpenter 1994, DOE-RL 1992e, EPA 1996)	Soil, concrete, misc. debris	Undetermined organic and inorganic chemicals	$176,869
	132-B-1 (108-B Tritium Separation Facility)	Facility originally designed for mixing and adding chemicals for treatment of reactor cooling water. Later converted to tritium recovery. Building demolished to 3 m (10 ft) below grade; any contaminated rubble left in situ. The site is 45 x 10 m (150 x 32 ft),depth unknown (References: Carpenter 1994, DOE-RL 1992e, EPA 1996)	Soil, concrete	Tritium (H-3)	$51,350
	132-B-3 (108-B Ventilation Exhaust Stack Site)	Stack and foundation were decontaminated, decommissioned, and demolished using explosives in 1983. Allowable residual contaminant level (ARCL) report calculations predicted 2.2 mrem/yr exposure from a radionuclide inventory of 21 mCi. Burial trench 9.1 x 76 x 5.5 m deep (30 x 250 x 18 ft deep). Trench and rubble covered with clean fill. (References: Carpenter 1994, EPA 1996)	Concrete, steel liner, soil	Undetermined radionuclides	$80,057

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-BC-1 (cont.)	132-B-4 (117-B Filter Building)	Building was decontaminated, decommissioned, and demolished in situ. ARCL report calculations predicted less than 1 mrem/yr exposure from a radionuclide inventory of 92 nCi. Rubble was buried from 1 to 5 m deep (3.3 to 16 ft deep) under clean fill. Building was originally reinforced concrete 18.3 x 12 m (59 x 39 ft) and 10.7 m (35 ft) high, with only 2.4 m (8 ft) above grade. (References: Carpenter 1994, EPA 1996, DOE-RL 1993a)	Concrete, soil	H-3, C-14, Sr-90, Cs-137, Pu-239/240	$95,088
	132-B-5 (115-B/C Gas Recirculation Facility)	Building was decontaminated, decommissioned, and demolished in situ. ARCL report calculations predicted 17 mrem/yr exposure. The facility contained vacuum and pressure seal pits and tunnels. The site is 51 x 30 x 3.4 m deep (168 x 98 x 11 ft deep). (References: Carpenter 1994, EPA 1996, DOE-RL 1993a)	Concrete, soil	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Pu-239	$69,188
	1607-B2[a] (124-B-2 Septic System)	Received sanitary wastes from office buildings, 105-B Reactor, and 190-B Pumphouse. Reinforced concrete septic tank and tile drain field. Top visible, has two steel manhole covers on concrete slab. Site is reported to be 7.6 x 3.5 x 4 m deep (25 x 11.5 x 13 ft deep). Drain field is 90 x 23 m (300 x 75 ft). (References: Carpenter 1994, EPA 1996)	Concrete, soil, steel, tile	Undetermined organic and inorganic chemicals	$72,945
	1607-B7 (124-C-1 Septic System)	Received sanitary sewage from 183-B Water Treatment Plant. Reinforced concrete septic tank and tile drain field. Tank is 1.8 x 1 x 2.5 m deep (6 x 3 x 8 ft deep); drain field is 71 m^2 (768 ft^2). (References: Carpenter 1994, EPA 1996)	Concrete, tile, soil	Undetermined organic and inorganic chemicals	$51,350
100-BC-2 (CERCLA site EPA lead)	100-B-1[b] (Surface Chemical Dumping Area)	Undocumented solid and liquid waste site and laydown yard. Area approximately 45.7 x 30.5 m (150 x 100 ft) containing several surface dump sites. Depth of contamination unknown. Site reportedly smells of oil and other petrochemicals. Affected soils are vegetation-free. (Reference: Carpenter 1994)	Soil, concrete, miscellaneous debris	Petroleum hydrocarbons; Undetermined organic and inorganic chemicals	$74,126
	100-C-3 (119-C Sample Building French Drain)	Received water coolant from the heat exchanger for the air sampler and effluent from the building swamp cooler and floor drain. Site is a small French drain (approximately 0.6 m [2 ft] diameter) associated with the 119-C Sample Building. (Reference: Carpenter 1994)	Soil, unknown construction materials	Undetermined organic and inorganic chemicals	$52,495
	100-C-7 (183-C Filter Building Demolition Waste)	Building demolished with concrete contaminated with sodium dichromate left in place, along with steam pipe covered with asbestos. Remaining concrete backfilled to minimum of 1 m (3 ft). Site leveled to match existing terrain. Site is 93 x 88 x 3 m deep (305 x 290 x 10 ft deep). (Reference: WIDS)	Concrete, soil, steel, asbestos	Sodium dichromate	$120,703
	116-C-3 (Chemical Waste Tanks)	Two below ground storage tanks which may have never been used. The tanks were installed to receive caustic waste from the metal examination facility and may be filled with water. Both tanks are 3.7 m (12 ft) diameter x 3.7 m (12 ft) deep. (References: Carpenter 1994, EPA 1996)	Steel, soil	Undetermined organic and inorganic chemicals	$59,382
	116-C-6 (Percolation Pit)	Received treated water from the 105-C Fuel Storage Basin cleanup project. Contaminated water was processed through filters and an ion exchange system before discharge. Site is an unlined, "L"-shaped, open excavated pit with side lengths of 30.5 m, 30.5 m, 13.7 m, 16.8 m, and 15.2 m; total area of 674 m^2 (side lengths of 100 ft, 100 ft, 45 ft, 50 ft, 55 ft; total area of 7,250 ft^2). (Reference: Carpenter 1994)	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Cr VI	$52,638

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100 DR-2 (cont.)	116-DR-10 (105-DR Fuel Storage Basin Cleanout Percolation Pond)	Received treated water from the 105-DR Fuel Storage Basin cleanup project. Contaminated water was processed through filters and an ion exchange system before discharge. In 1984 contaminated soil was removed and site was released using ARCL methodology. Pit has been backfilled and graded to match the terrain of the area. Site is 24.4 x 15.2 m (80 x 50 ft), depth of excavation is unknown. (References: Carpenter 1994, EPA 1996, DOE-RL 1995c)	Soil	Undetermined radionuclides	$49,203
	128-D-1 (100-D/DR Burning Pit)	Used for burning of an estimated 40,000 m^3 of nonradioactive combustible materials such as paint waste, office waste, and chemical solvents. Disposal site was used from 1944-1967. Site was 30.5 x 30.5 x 3 m deep (100 x 100 x 10 ft deep). Radioactively contaminated materials were found at the site in 1951 and removed. (References: Carpenter 1994, EPA 1996, DOE-RL 1995c)	Soil, asbestos, miscellaneous debris	Undetermined radionuclides, inorganic and organic chemicals	$80,059
	132-DR-1 (1608 DR Wastewater/ Effluent Pumping Station)	Building was decontaminated, decommissioned, and demolished in situ in 1987. Received water from reactor building drains (primarily fuel storage basin overflows) containing low-level radionuclides and decontamination chemicals. Pumped water from collection pits to 105-DR Reactor process effluent pipelines. Site is 11 x 10.4 x 8.5 m deep (36 x 34 x 28 ft deep). (References: Carpenter 1994, EPA 1996, DOE-RL 1995c)	Concrete, soil	Undetermined radionuclides, organic and inorganic chemicals	$121,951
	600-30 (100-DR Construction Lay-down Area)	Site is an open field containing miscellaneous debris and areas of distressed vegetation. Approximate dimensions are 213 x 183 x 1.5 m deep (700 x 600 x 5 ft deep).	Soil	Organic Solvents; Petroleum Hydrocarbons	$134,127
100 FR-1 (CERCLA site - EPA lead)	100-F-4 (108-F Building 12-in. French Drain)	Vertical 0.3-m- (1-ft) diameter vitrified clay pipe adjacent to south wall of the 108-F Building. A 1.3-cm (½-in.) steel pipe enters the drain from the 108-F Building. No record of dates of operation, waste type, or quantity. (References: Deford 1994, EPA 1996)	Clay and steel pipes	Undetermined organic and inorganic chemicals	$52,638
	100-F-7[b] (1705-F Building Fuel Storage Tank)	Location of a steel underground fuel oil storage tank for the 1705-F Building Heater Room (building was demolished in 1975). It is not known if the tank was removed when the building was demolished. Dimensions unknown. (Reference: Carpenter 1994)	Soil	Undetermined organic and inorganic chemicals	$55,087
	100-F-9 (First French Drain at East End of 105-F Storage Room)	Vertical 0.9-m- (3-ft) diameter concrete pipe buried to unknown depth with upper surface 5 cm (2 in.) above grade. Located adjacent to the northeast corner of the 105-F Miscellaneous Storage Room of the 105-F Reactor. The upper surface is a few inches above grade and is gravel filled. No record of dates of operation, waste type, and quantity. Drain has a 2.5-cm (1-in.) steel pipe coming from the 105-F Building. (Reference: Deford 1994)	Concrete, soil	Undetermined organic and inorganic chemicals	$52,638
	100-F-10 (Second French Drain at East End of 105-F Storage Room)	Vertical 0.9-m- (3-ft) diameter concrete pipe buried to unknown depth with upper surface 5 cm (2 in.) above grade. Located adjacent to the southeast corner of the 105-F Miscellaneous Storage Room of the 105-F Reactor. The upper surface is a few inches above grade and is gravel filled. No record of dates of operation, waste type, and quantity. Drain has a 2.5-cm (1-in.) steel pipe coming from the 105-F Building. (References: Deford 1994, EPA 1996)	Concrete, soil	Undetermined organic and inorganic chemicals	$52,638

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-DR-1 (cont.)	1607-D4 (Septic Tank and Drain Field)	Received sanitary sewage from the 115-D/DR Gas Recirculation Building. Reinforced concrete tank is 1.2 x 0.6 m (4 x 2 ft), buried about 2.5 m (8 ft) deep. Tile drain field is 36 m^2 (384 ft^2). (References: Carpenter 1994, EPA 1996, DOE-RL 1994g)	Concrete, tile, soil	Cs-137, Eu-152, undetermined organic and inorganic chemicals	$61,657
	1607-D5[a] (Septic Tank and Drain Field)	Received sanitary sewage from the 181-D River Pumphouse. Reinforced concrete tank is 1.2 x 0.6 m (4 x 2 ft), buried about 2.4 m (8 ft) deep. Tile drain field is 36 m^2 (384 ft^2). (References: Carpenter 1994, EPA 1996)	Concrete, tile, soil	Undetermined organic and inorganic chemicals	$61,657
	UPR-100-D-1[a] (Oil Soaked Soil)	Site is a small depression 0.6 m (2 ft) in diameter surrounded by oil-soaked soil. Natural vegetation partly obscures the site located east of the former location of the 190-D Building and south of a paved road. (Reference: Carpenter 1994)	Soil	Petroleum hydrocarbons; Undetermined organic chemicals	$46,912
100-DR-2 (RCRA site Ecology lead)	100-D-13 (1607-DR3 Septic Tank and Drain Field)	Received sanitary sewage from temporary construction facilities and overflow from the water towers at 100-D and 100-DR Reactors. Site is described as an Imhoff tank with open pit drain field. Tank is reinforced concrete 8.2 x 3.8 x 7.3 m deep (27 x 13 x 24 ft deep); open pit drain field is 18.2 x 18.2 m (60 x 60 ft). (Reference: Carpenter 1994)	Concrete, soil, pipes	Undetermined radionuclides	$49,203
	100-D-15 (Solid Waste Burial Site/ Borrow Pit)	Received debris and miscellaneous waste described as non-radioactive and non-hazardous, including paint cans, solvent cans, and construction materials. Waste material has been dumped at two locations in a large borrow pit southeast of the 100-DR reactor facilities (Gravel Pit #21). (Reference: WIDS)	Concrete, metal, miscellaneous debris	Undetermined organic and inorganic chemicals	$126,540
	100-D-21 (119-DR Building French Drain)	Site drawing H-1-19810 shows an "existing dry well" that received floor drainage and effluent from evaporative cooler in the 119-D Sample Building (demolished). The site is not marked or posted, lies in a cobble-covered field, and cannot be distinguished. Dimensions unknown. (Reference: WIDS)	Soil	Undetermined radionuclides, inorganic and organic chemicals	$73,824
	100-D-27 (151-D Substation Transformer Leak)	Mineral oil containing less than 50 ppm PCBs leaked from Transformer #A401C at the 151-D electrical substation. The transformer was repaired, and facility was powerwashed, all contaminated material was shoveled into seven 55 gallon drums, and the site backfilled with clean gravel. (Reference: WIDS)	Soil, gravel	PCBs	$52,940
	100-D-28 (190-DR Septic System)	Received sanitary sewage from the 190-DR Building. Described as a 2,725-L (720-gal) steel septic tank and clay tile drain field southwest of 190-DR Building. Tank is 1.8 x 1.8 x 2.5 m deep (6 x 6 x 8.3 ft deep), drain field is 122 m^2 (1,317 ft^2). (Reference: WIDS)	Steel, tile, soil	Undetermined organic and inorganic chemicals	$51,350
	116-DR-8 (117-DR Seal Pit Crib)	Received water contaminated with radioactive wastes from the 117-DR Building containment system and seal pits. Released from radiological controls prior to 1967 (Dorian and Richards [1978]). Located about 76 m (250 ft) south of DR exclusion area fence and directly east of the 118-DR-1 burial ground. Crib is 3 x 3 x 5.2 m deep (10 x 10 x 17 ft deep), buried 1.2 m (4 ft) deep. Facility is registered as an injection well. Operated 1960-1964. (References: Carpenter 1994, EPA 1996, DOE-RL 1995c)	Soil	H-3, C-14	$81,798

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-DR-1 (cont.)	100-D-30 (Sodium Dichromate Soil Contamination)	Sodium dichromate soil contamination found after demolition of the 190-D Building. Also called 185-D NaCr Trench. Dimensions given are 93 x 1 m (304 x 3.3 ft). Site may be covered with 3 m (10 ft) of clean soil and rubble backfill from 190-D Building demolition. (Reference: WIDS)	Soil	Sodium dichromate	$48,645
	116-D-10 (105-D Fuel Storage Basin Cleanout Percolation Pits)	Received treated water from the 105-D Fuel Storage Basin cleanup project. Contaminated water was processed through filters and an ion exchange system before discharge. After an unplanned release, the two pits were excavated, contaminated soil was removed, and the site surveyed, released, and backfilled. West pit was 10.7 x 6.7 x 0.9 m deep (35 x 22 x 3 ft deep), under the backfill. East pit was 15.2 x 7.3 x 1.2 m deep (50 x 24 x 4 ft deep). (References: Carpenter 1994, EPA 1996)	Soil	Undetermined radionuclides	$51,350
	128-D-2 Burning Pit	Received noncontaminated graphite blocks and other solid wastes during reactor construction. Located about 180 m (600 ft) northeast of the 128-D-1 burn pit. Site is approximately 73 x 73 m (240 x 240 ft). No definite boundaries. Concrete and metallic debris exposed. Currently used to dispose of tumbleweeds. (References: Carpenter 1994, EPA 1996)	Soil, concrete, metals	Undetermined inorganic and organic chemicals	$123,037
	130-D-1[b] (1716-D Gasoline Storage Tank Site)	Former location of a steel underground gasoline storage tank (removed during 1989). Tank was part of the former 1706-D fuel station that operated from 1944 to 1968 and was used for storage of leaded gasoline. After removal of the tank, the site was backfilled without removal of contaminated soil. Dimensions unknown. (Reference: Carpenter 1994)	Soil	Petroleum hydrocarbons; Undetermined organic and inorganic chemicals	$52,940
	132-D-1 (115-D/DR Gas Recirculating Facility)	Building was decontaminated, decommissioned, and demolished in situ in 1985-1986. ARCL report calculations exist. Site consisted of a building with vacuum and pressure seal pits and tunnels to the 105-D and 105-DR Reactor Buildings. Site is 51 x 30 x 3.4 m deep (168 x 98 x 11 ft deep). Buried under at least 1 m (3.3 ft) of backfill. (References: Carpenter 1994, EPA 1996, DOE-RL 1994g)	Concrete, metal	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Pu-239	$72,513
	132-D-2 (117-D Filter Building)	Building was decontaminated, decommissioned, and demolished in situ in 1986. ARCL report calculations exist. The site is 18 x 12 x 8.2 m deep (59 x 39 x 27 ft deep). Contaminated rubble is buried a minimum of 1 m (3.3 ft) deep, except for seal pit rubble, which is buried under minimum of 5 m (16.4 ft) clean fill. (References: Carpenter 1994, EPA 1996, DOE-RL 1994g)	Concrete, soil	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Pu-239	$99,382
	132-D-3 (1608-D Waste Water/Effluent Pumping Station)	Building was decontaminated, decommissioned, and demolished in situ in 1986-1987. ARCL report calculations exist. Received water from reactor building drains (primarily fuel storage basin overflows) containing low-level radionuclides and decontamination chemicals. Pumped water from collection pits to 105-D Reactor process effluent pipelines. Site is 6.1 x 6.1 x 9.8 m deep (20 x 20 x 32 ft deep). (References: Carpenter 1994, EPA 1996, DOE-RL 1994g)	Concrete, soil	C-14, Sr-90, Tc-99, Ra-226, U-235, U-238, Pu-239, Am-241, undetermined organic chemicals	$128,823
	628-3 (Burn Pit)	Used for burning of nonradioactive, combustible wastes, including construction debris and chemical solvents. Depression in site center shows signs of severe plant stress and soil discoloration. Site is approximately 76 x 12.2 m (250 x 40 ft) and poorly defined. Site is littered with burned wood, nails, metal pipes, rebar, and glass debris. (References: Carpenter 1994, EPA 1996)	Soil, miscellaneous debris	Undetermined organic and inorganic chemicals, asbestos	$126,540

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-BC-2 (cont.)	128-C-1 (100-C Burning Pit)	Used for burning nonradioactive combustible materials and disposal of noncontaminated equipment and other solid waste. Site is 68.6 x 38 m (225 ft x 125 ft) and reportedly contains short-lived radionuclides. (References: Carpenter 1994, DOE-RL 1994f)	Soil, concrete, miscellaneous debris	Undetermined organic and inorganic chemicals	$77,792
	132-C-1 (105-C Reactor Stack Burial Ground)	Stack and foundation were decontaminated, decommissioned, and demolished using explosives in 1983. ARCL report calculations predicted 4.4 mrem/yr exposure from a radionuclide inventory of 2.8 millicuries. Site is an unmarked, vegetation-free cobble-covered field 61 m (200 ft) long, 9.2 m (30 ft) wide, and 4.6 m (15 ft) deep. (References: Carpenter 1994, DOE-RL 1994f)	Concrete	Co-60, Sr-90, Cs-137, Eu-154, Pu-238, Pu-239/240	$55,803
	132-C-3 (117-C Filter Building Site)	Building was decontaminated, decommissioned, and demolished in situ in 1988. ARCL report calculations exist. Rubble was buried from 1 to 5 m deep (3.3 to 16 ft) under clean fill. Building was originally reinforced concrete 18 x 12 m (59 x 39 ft) and 10.7 m (35 ft) high, with only 2.4 m (8 ft) above grade. (References: Carpenter 1994; DOE-RL 1994f, 1993c)	Concrete, soil	H-3, C-14, Sr-90, Cs-137, Eu-154, Eu-152, Pu-239/240	$95,088
	1607-B8 (Septic Tank and Drain Field)	Received sanitary sewage from 190-C Pumphouse. 1,325-L (350-gal) steel septic tank and tile drain field. Septic tank dimensions are 1.8 x 0.9 x 2.5 m deep (6 x 3 x 8.3 ft deep). Drain field is 59 m^2 (640 ft^2). (References: Carpenter 1994, EPA 1996)	Steel, tile, soil	Undetermined organic and inorganic chemicals	$51,350
	1607-B9 (Septic Tank and Drain Field)	Received sanitary sewage from 105-C Reactor. 9,085-L (2,400-gal) septic tank and tile drain field. Septic tank dimensions are 4.3 x 0.9 x 2.5 m deep (14 x 3 x 8.3 ft deep). Drain field is 408 m^2 (4390 ft^2). (References: Carpenter 1994, EPA 1996)	Concrete, tile, soil	Undetermined organic and inorganic chemicals	$51,350
	1607-B10 (Septic Tank and Drain Field)	Received sanitary sewage from headhouse of 183-C Water Treatment Plant. 1,325-L (350-gal) steel septic tank and tile drain field. Site dimensions are 4.6 x 9.1 m (15 30 ft), depth assumed to be 2.5 m (8.3 ft). Drain field is 59 m^2 (640 ft^2). (Reference: EPA 1996)	Steel, tile, soil	Undetermined organic and inorganic chemicals	$51,350
	1607-B11 (Septic Tank and Drain Field)	Received sanitary sewage from 183-C Filter Building and Pump Room. 1,325-L (350-gal) steel septic tank and tile drain field. Site dimensions are 4.6 x 9.1 m (15 x 30 ft), depth assumed to be 2.5 m (8.3 ft). Drain field is 59 m^2 (640 ft^2). (References: Carpenter 1994, EPA 1996)	Steel, tile, soil	Undetermined organic and inorganic chemicals	$51,350
100-DR-1 (CERCLA site - EPA lead)	100-D-8 (105-DR Process Sewer Outfall)	Received waste water from water treatment facilities, including chemical discharges from spills in the treatment facilities. Potential contamination from the 100-D Area Cask Pad storm drains. Site is upstream of the 181-D Pumphouse. Structure was demolished in 1978, and covered to blend with the riverbank appearance. Dimensions unknown. (Reference: Carpenter 1994)	Concrete, soil	Undetermined radionuclides and organic chemicals	$70,389
	100-D-7 (Dumping Area)	Solid waste surface dumping areas containing nonradioactive, non-hazardous waste including vitrified clay pipe, concrete cores, metal paint cans, and wood debris located north and east of the 128-D-2 burn pit. Approximate dimensions are: west area - 35 x 24 m (115 x 80 ft), northeast area - 80 x 45 m (260 x 120 ft), east area - 31 x 45 m (100 x 120 ft).	Concrete, tile, soil	Undetermined organic and inorganic chemicals	$96,300
	100-D-24 (119-D Sample Building French Drain)	Site drawing H-1-19810 shows an "existing dry well" located south of the 119-D Sample Building (demolished) that received drainage from a floor drain. A 5-cm (2-in) drain pipe 0.9 m (3 ft) below grade connected the building to the dry well. The site is not marked or posted, lies in a cobble-covered field, and cannot be distinguished. Dimensions unknown. (Reference: WIDS)	Soil	Undetermined radionuclides, inorganic and organic chemicals	$73,824

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-FR-1 (cont.)	100-F-11 (108-F Building 18-in. French Drain)	Vertical 0.5-m (1.5-ft) diameter concrete pipe (length unknown) adjacent to northwest corner of the electrical substation on west wall of 108-F Building. No record of dates of operation, waste type, and quantity. The drain surface is a few inches above grade, has no cover, and is filled with gravel. (References: Deford 1994, EPA 1996)	Concrete, soil	Undetermined organic and inorganic chemicals	$52,638
	100-F-12 (36-in. French Drain at 105-F Building)	Vertical 0.9-m- (3-ft) diameter concrete pipe of unknown length standing 5 cm (2 in.) above grade with a steel lid. Located at the northeast corner of the 105-F Reactor. No record of dates of operation, waste type, or quantity. (References: Deford 1994, EPA 1996)	Concrete, steel, soil	Undetermined organic and inorganic chemicals	$52,638
	100-F-16 (108-F Building 30-in. French Drain)	Vertical 0.8-m- (2.5-ft) diameter steel pipe of unknown length adjacent to south wall of 108-F Building east porch. No record of dates of operation waste type, or quantity. (Reference: Deford 1994)	Steel, soil	Undetermined organic and inorganic chemicals	$52,638
	100-F-18 (Former Condensate Tank at 105-F)	Received condensate from the 105-F Fan House and discharged to a drain field. Tank and piping were removed during demolition of the fan house in 1994, but drain field may remain in place. No record of dates of operation, waste type, or quantity. (Reference: Deford 1994)	Steel	Undetermined organic and inorganic chemicals	$68,686
	100-F-23 (141-F Drywell)	Received liquid wastes from the 141-C Building. During removal of the 141-C Building foundation, the adjacent soil was found to be contaminated and removed, the drywell (within 3.5 m [10 ft] of the building) may have been removed at that time. There is no current evidence of a drywell at the site, but the site is located within an area posted as "Underground Radioactive Material." (Reference: WIDS)	Soil	Undetermined radionuclides	$63,518
	100-F-24 (145-F Drywell/ French Drain)	The drywell received liquid animal wastes, and may have been removed or covered with backfill during the demolition of the 145-F Facility, which was buried in place. (Reference: WIDS)	Soil	Undetermined organic and inorganic chemicals	$73,824
	100-F-25 (146-FR Drywells/ French Drains	There is no evidence of drywells or French drains in the area. The units may have been removed or covered with backfill during removal of the nearby 146-FR slab in 1975. No record of dates or operation, waste type, or quantity. (Reference. WIDS)	Unknown	Undetermined organic and inorganic chemicals	$61,657
	100-F-29 (EAF Process Sewer Pipelines)	This unit contains the many process sewer lines at the Experimental Animal Farm site. When the buildings were removed, the underground lines were left in place. The unit excludes the Reactor and Water Treatment effluent lines. (References: Deford 1994, DOE-RL 1992a)	Concrete, clay, metal	I-131, Sr-90, Cs-137, U-235, U-238, Pu-239/240	$123,105
	100-F-31 (144-F Sanitary Sewer System)	The site is the septic system receiving sanitary sewage from the 144-F Building. Site drawings do not indicate if system also received animal wastes with human wastes. The septic system may have been removed during the D&D of 144-F in 1977. (Reference WIDS)	Soil	Undetermined radionuclides and inorganic chemicals	$54,785
	100-F-33 (1705-F Fish Farm)	May have received unplanned releases of water containing process effluent from the fish ponds. No releases are known, but the ponds were unlined, unreinforced concrete, and they and their piping may have leaked. Water from the ponds was discharged to the PNL Outfall via the 147-F Pumphouse. The pond structures were removed in 1975 and the site backfilled. (Reference. DOE-RL 1992a)	Soil	Undetermined radionuclides	$49,203

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100 FR 1 (cont.)	100-F-34 (Biology Facility French Drain)	Believed to have received waste water from the 1705-F Radiobiology Laboratory or Fish Ponds. The site is a 0.7-m- (29-in.) diameter clay pipe, approximately 0.6 m (2 ft) deep. (Reference: WIDS)	Clay pipe, soil	Undetermined organic and inorganic chemicals	$61,657
	116-F-7 (117-F French Drain)	Received drainage from the confinement exhaust systems filter seal pits in the 117-F Building during 1960-1965. Radionuclides received had a short half-life and have decayed until they are no longer of concern. Site was released from radiation zone status. The piping system contained some asbestos-concrete pipes. (Reference: Deford 1994)	Concrete, asbestos, soil, clay	Undetermined radionuclides	$52,638
	116-F-12 (148-F French Drain)	Received an estimated 10,000 L of effluent pump prime water from the lift station between 1944 and 1964. Drain is 0.9-m (36-in.) diameter by 1.8-m (6-ft) deep (constructed of clay or concrete pipe). Liquids discharged to the drain percolated into the soil. Contaminants, if any, are unknown. (Reference: Deford 1994)	Concrete, clay, soil	Undetermined organic and inorganic chemicals	$43,477
	126-F-2 (183-F Clearwells)	Former clearwells for storage of river water being processed for reactor coolant. Partially demolished and used as an inert landfill for disposal of uncontaminated rubble and debris from D&D projects. Dimensions are 229 x 41 x4.6 m deep (751 x 135 x 15 ft deep).	Concrete, Soil	Possible Low-Level Radioactive Waste	$118,194
	128-F-2 (100 F Burning Pit)	Irregularly shaped depression used for burning nonhazardous office waste, vegetation, paint, solvents, and other combustibles. Received some hardware and machinery. The site was buried with clean soil in preparation for drilling test well FS-42 in 1992. Pit was 45.7 x 18.3 x 3 m deep (150 ft x 60 ft x 10 ft deep). (References: Deford 1994, EPA 1996)	Soil	Undetermined organic chemicals	$52,940
	132-F-1 (Chronic Feeding Barn Site)	Feeding Barn was a 455-m² (4,900-ft²) concrete block building with concrete animal pens; main housing facility for sheep and other livestock used in radiological dose studies. The facilities were cleaned out and washed down regularly; drains were connected to sewer 100-F-29. Operated 1950-1980. Demolished sometime after 1980 and buried in place. May still contain residual radiological contamination; there are no records of decommissioning activities. Sampled in 1992 (WHC-SD-EN-TI-128, Rev 0). (References: DOE-RL 1994d, EPA 1996)	Soil, concrete	Sr-90, Cs-137, Pu-239	$57,950
	132-F-3 (115-F Gas Recirculating Facility Site)	Building D&D'd in situ in 1984. ARCL report calculations exist. Dimensions are 53.3 x 30.5 x 4 m deep (175 x 100 x 13 ft deep). The area was covered with clean backfill to an average depth of 2.1 to 2.7 m (7 to 9 ft). Site is now a gravel lot, free of debris. (References: Beckstrom 1984, Deford 1994, DOE-RL 1994d, EPA 1996)	Concrete, metal pipes, soil	H-3, C-14, Co-60, Sr-90, Cs-137	$72,588
	132-F-4 (116-F Reactor Stack Demolition Site)	Stack and foundation were decontaminated, decommissioned, and demolished using explosives in 1983. ARCL report calculations predicted 12.5 mrem/yr exposure using radionuclide assays before decontamination. The burial trench is 61 x 6.1 x 4.6 m deep (200 x 20 x 15 ft deep). Rubble was covered with 1 m (3 ft) of soil. (References: Beckstrom 1984, Deford 1994, EPA 1996)	Concrete	H-3, C-14, other beta and gamma emitting radionuclides	$57,950
	132-F-5 (117-F Filter Building Site)	Received and filtered ventilation air from the work areas of the 105-F Reactor Building and discharged it to the 116-F Stack. Building was decontaminated, decommissioned, and demolished in situ in 1984. ARCL report calculations exist. Rubble was buried under 1 m (3.3 ft) of clean soil. Site dimensions are 18.3 x 12.2 x 8.2 m deep (60 x 40 x 27 ft deep). (References: Deford 1994, EPA 1996)	Concrete	C-14, Co-60, Cs-137, Sr-90, Eu-154, Eu-152	$99,382

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-FR-1 (cont.)	132-F-6 (1608-F Waste Water Pumping Station Site)	Pumped waste water containing trace amounts of low-level radionuclides and decontamination chemicals from drains and sumps in the 105-F Reactor Building into the process effluent pipeline. Dimensions are 15.2 x 15.2 x 10.4 m deep (50 x 50 x 34 ft deep); demolished and buried under 5 m (16 ft) of clean fill. (References: Deford 1994, EPA 1996)	Concrete	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Eu-154, undetermined inorganic chemicals	$128,823
	141-C (Large Animal Barn and Biology Laboratory)	This facility was a steel building on a concrete pad, covering 431 m^2 (4,640 ft^2). The building, concrete foundation, footings, and adjacent contaminated soil were removed and disposed of to the 200 Area Burial Ground. Underground pipes were left in place. Fifty soil samples were taken after demolition was completed to demonstrate release under AEC Regulatory Guide 1.86. (Reference: EPA 1996)	Metal pipes	I-131, Sr-90, Cs-137, Pu-239	$55,803
	182-F (182-F Reservoir)	Inert landfill for disposal of debris from D&D projects. Covered with fill from adjacent land. 560 x 309 x 15 ft deep.	Concrete, Soil	Possible Low-Level Radioactive Waste	$123,322
	1607-F3 (124-F-3 Septic System)	Received sanitary sewage from the 182-F Pump Station, 183-F Water Treatment Plant, and 151-F Substation. Reinforced concrete septic tank 2.6 x 1.3 x 3.4 m deep (8.5 x 4.5 x 11 ft deep). The drain field is 244 m^2 (2,624 ft^2). (References: Deford 1994, EPA 1996)	Concrete, clay tile, soil	Undetermined organic and inorganic chemicals	$61,657
	1607-F4 (124-F-4 Septic System)	Received sanitary sewage from the 115-F Gas Recirculation Building. Dimensions of the reinforced concrete septic tank are 1.2 x 0.6 x 2.5 m deep (4 x 2 x 8.3 ft deep). The drain field is 36 m^2 (384 ft^2). (References: Deford 1994, EPA 1996)	Concrete, clay tile, soil	Undetermined organic and inorganic chemicals	$61,657
	1607-F5 (124-F-5 Septic System)	Received sanitary sewage from the 181-F Pumphouse. Dimensions of the reinforced concrete septic tank are 1.2 x 0.6 x 2.5 m deep (4 x 2 x 8.3 ft deep), the drain field is 36 m^2 (384 ft^2). (References: Deford 1994, EPA 1996)	Concrete, clay tile, soil	Undetermined organic and inorganic chemicals	$61,657
	1607-F7 (124-F-7 Septic System)	Received sanitary sewage from the 141-M Building. Dimensions of the septic tank are not known. The drain field is estimated to be 170 m^2 (1,830 ft^2). (References: Deford 1994, EPA 1996)	Unknown	Undetermined organic and inorganic chemicals	$61,657
	UPR-100-F-1 (141-C to 141-M Sewer Line Leak)	Spill of 64,352 L (17,000 gal) of animal pen wash water occurred when a process sewer line from the 141-C Hog Barn plugged and overflowed adjacent to the building in 1971. Spill site, 12.2 x 12.2 m (40 x 40 ft), is located within the permanent protective concrete monuments surrounding the Experimental Animal Farm. (Reference: Deford 1994)	Soil	Sr-90, Pu-239	$49,203
	UPR-100-F-3 (Mercury Spill at 146-F Fish Lab)	Received mercury spilled on the floor of the 146-FR Fish Lab (since demolished). All material was "squeegeed" out the door of the building and was reported to have been cleaned up and removed. Contamination was limited to a 3 x 3 m (10 x 10 ft) area of surface soil near the northeast corner of the building. Building site is now a cobble-covered field. (Reference: Deford 1994)	Soil	Hg	$48,645
100-FR-2 (CERCLA site EPA lead)	100-F-14 (Vent Pipe)	A 10-cm (4-in.) pipe extends 1 m (3.3 ft) above grade. Ground penetrating radar indicates that the vent is attached to a tank (probably concrete) that received wastes from a nearby demolished carpenter shop. Dimensions unknown. (References: Bergstrom and Mitchell 1995, Deford 1994, EPA 1996)	Metal pipe, concrete	Undetermined organic and inorganic chemicals	$112,225

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-FR-2 (cont.)	100-F-28 (Septic System)	The site is a septic tank and drain field for a small building not near any contaminated facilities. The assumed size of the unit is 18.3 x 18.3 m (60 x 60 ft). (Reference: WIDS)	Unknown	Undetermined organic and inorganic chemicals	$51,350
	118-F-4 (Silica Gel Burial Ground, 115-F Pit)	Received 270 kg (0.3 tons) of silica gel from the 115-F dryer rooms. Silica gel was disposed to a small unlined disposal pit 3 x 3 x 4.6 m deep (10 x 10 x 15 ft deep). The site appears as an open, unvegetated cobble field. (References: Deford 1994, EPA 1996)	Soil, silica gel	Undetermined radionuclides, inorganic and organic chemicals	$68,686
	128-F-1 (Burning Pit)	Used for burning nonradioactive, combustible materials such as an paint waste, office waste, and chemical solvents. Burning pit is 30.5 x 30.5 x 3 m deep (100 x 100 x 10 ft deep). Located east of the 126-F-1 Ash Pit. Operated 1945-1965. Site has been backfilled. (References: Deford 1994; DOE-RL 1992a, 1995b, EPA 1996)	Soil, miscellaneous debris	Undetermined organic and inorganic chemicals	$67,462
	128-F-3 (PNL Burning Pit)	Used for burning materials from the Experimental Animal Farm. Shallow pit 30.5 x 30.5 m (100 x 100 ft), 30.5 m (100 ft) east of the 100-F ash pit. Pit was backfilled with coal ash. No records available on materials burned. (References: Deford 1994, EPA 1996)	Ash, soil	Undetermined organic and inorganic chemicals	$80,059
	1607-F1 (124-F-1 Septic System)	Received sanitary sewage from the 1701-F Badge House, 1709-F Fire Station, and 1720-F Administrative Office. The reinforced concrete septic tank is 4.3 x 2.1 x 3.4 m deep (14 x 7 x 11 ft deep). The drain field is 968 m² (21,600 ft²). (References: Deford 1994, EPA 1996)	Concrete, vitrified pipe, soil	Undetermined organic and inorganic chemicals	$51,350
100-HR-1 (CERCLA site - EPA lead)	100-H-3[b] (1716-H Gasoline Storage Tank Site)	Location of a steel underground gasoline storage tank for an automotive service station that operated from 1949-1965. The automotive service area included gas pumps with underground storage tanks and possibly an oil pit. No records could be located to determine whether the fuel tanks have been removed. Dimensions unknown. (Reference: Deford and Einan 1995)	Soil	Petroleum hydrocarbons; Undetermined organic and inorganic chemicals	$55,087
	100-H-4 (1717-H Hot Shop French Drain)	Site of a former maintenance building that was decontaminated and decommissioned in the 1970's. French drain was apparently used for disposal of low-level radioactive materials. Dimensions unknown. (References: Deford and Einan 1995, EPA 1996)	Soil	Undetermined radionuclides and organic chemicals	$70,389
	100-H-7 (French Drain A)	Vertical 0.76-m- (2.5-ft) diameter vitrified clay pipe (length unknown) located 5.5 m (18 ft) east of the 105-H Reactor Building. No record of dates of operation, waste type, or quantity. A 6.3-cm (2.5-in.) steel pipe from the reactor is in line with the drain, suggesting a connection. (References: Deford and Einan 1995, EPA 1996)	Soil, vitrified clay	Undetermined radionuclides	$51,350
	100-H-8 (French Drain B)	Gravel-filled vertical 0.91-m- (3-ft) diameter concrete pipe with a steel cover (length unknown) located 9.1 m (30 ft) east of the 105-H Reactor Building. No record of dates of operation, waste type, or quantity. (References: Deford and Einan 1995, EPA 1996)	Concrete, soil	Undetermined organic and inorganic chemicals	$51,350
	100-H-9 (French Drain C)	Vertical 0.6-m- (2-ft) diameter concrete pipe (length unknown) located 27 m (90 ft) west of the northwest corner of the 105-H Reactor Building. No record of dates of operation, waste type, or quantity. (References: Deford and Einan 1995, EPA 1996)	Concrete, soil	Undetermined organic and inorganic chemicals	$51,350

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-HR-1 (cont.)	100-H-10 (French Drain D)	Vertical 1.2-m- (4-ft) diameter vitrified clay pipe with steel lid (length unknown) located 7.6 m (25 ft) north of the 105-H Reactor Building. No record of dates of operation, waste type, or quantity. (Reference: Deford and Einan 1995)	Concrete, soil	Undetermined organic and inorganic chemicals	$51,350
	126-H-2* (183-H Clearwells; Disposal Pit)	Two 228.6 x 41.1 x 5.5 m (750 ft x 135 ft x 18 ft) deep reinforced concrete basins at the site of the former 183-H Water Treatment Facility. The basins were historically used to store clean reactor coolant water. Eastern half currently holds D&D rubble (west half is still intact). Waste from the 183-H Solar Evaporation Basins that was disposed here is suspected of being contaminated with radionuclides. (Reference: Deford and Einan 1995)	Concrete, steel, miscellaneous debris	Undetermined radionuclides and inorganic chemicals	$196,333
	132-H-1 (116-H Reactor Exhaust Stack Burial Site)	Stack and foundation were decontaminated, decommissioned, and demolished using explosives in 1983. ARCL report calculations exist. Low-level smearable contamination was present on concrete at the time of demolition. The burial trench was 67 x 7.6 x 3 m deep (220 x 25 x 10 ft deep). Rubble was covered with 1 m (3 ft) of soil. (References: Deford and Einan 1995, DOE-RL 1995b, EPA 1996)	Concrete	C-14, H-3, Cs-137, Co-60, Eu-152, Eu-154, Eu-155	$57,950
	132-H-3 (1608-H Waste Water Pumping Station Site)	Received waste water containing trace amounts of low-level radionuclides and decontamination chemicals from drains and sumps in the 105-H Reactor Building and pumped these wastes into the process effluent pipeline. Dimensions are 11 x 10.4 x 9.7 m deep (36 x 34 x 32 ft deep), buried under clean fill. (References: Deford and Einan 1995, DOE-RL 1995b, EPA 1996)	Concrete, soil	Pb, undetermined radionuclides	$114,413
100-HR-2 (RCRA site - Ecology lead)	128-H-1 (Burning Pit)	Used for burning nonradioactive, combustible materials such as an paint waste, office waste, and chemical solvents. Burning pit is 91.5 x 91.5 x 3 m deep (300 x 300 x 10 ft deep). Pit has been partially backfilled with soil and ash. Some debris remains at the site. (References: Deford and Einan 1995; DOE-RL 1993d, 1994b; EPA 1996)	Soil, miscellaneous debris	Undetermined organic chemicals	$101,919
	128-H-2 (Burning Pit)	Used for burning nonradioactive, combustible materials such as paint waste, office waste, and chemical solvents. Burning pit is 52 x 41.2 m (170 x 135 ft), depth unknown. (References: Deford and Einan 1995; DOE-RL 1993d, 1994b; EPA 1996)	Soil	Undetermined organic chemicals	$68,766
	128-H-3 (100-H Burning Ground #3)	Used for burning nonradioactive, combustible materials such as vegetation, office waste, paint waste, and chemical solvents. Dimensions are approximately 55 x 21 x 1.5 m deep (180 x 70 x 5 ft deep).	Soil	Organic Solvents; Petroleum Hydrocarbons	$65,787
	132-H-2 (117-H Filter Building Site)	Received and filtered ventilation air from the work areas of the 105-H Reactor Building and discharged it to the 116-H Stack. Building was decontaminated, decommissioned, and demolished in situ in 1984. ARCL report calculations exist. Site dimensions are 18.3 x 12.2 x 9.6 m deep (60 x 40 x 32 ft deep). Rubble was buried under 5 m (16 ft) of clean fill. The site also includes the original location of the 116-H-4 Photo Crib, which was excavated in 1960 and moved to a different location. (References: Deford and Einan 1995, DOE-RL 1993d, EPA 1996)	Concrete	H-3, C-14, Co-60, Cs-137, Sr-90, Eu-152, Eu-154, Pu-239/240	$110,118
	600-151 (Pre-Hanford Dumping Area)	Scattered debris and disturbed vegetation caused by pre-Hanford residents. Under authority of DOE Site Infrastructure Division, EM-70. Dimensions are approximately 244 x 183 x 0.15 m deep (800 x 600 x 0.5 ft deep)	Soil	Probable Pesticides and Petroleum Hydrocarbons	$138,422

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-HR-2 (cont.)	1607-H1* (Septic Tank and Drain Field)	Received sanitary sewage from the 151-H and 105-H Buildings at an estimated flow rate of 503 l/day (140 gal/day). The concrete septic tank is 4.6 x 1.7 x 4.4 m deep (15 x 5.5 x 14.5 ft deep); the tile field is reported to be 17.1 x 15.2 m (56 x 50 ft). (References: Deford and Einan 1995, DOE-RL 1994b, EPA 1996)	Concrete, soil, tile	Undetermined organic and inorganic chemicals	$51,350
100-KR-2 (CERCLA site - EPA lead)	100-K-13 (Liquid Waste Site [French Drain])	Used for disposal of "gray water" waste during construction activities. Located west of 166-KW oil storage tank. This isolated French drain is 1.5 m (5 ft) in diameter, constructed of concrete, and 0.5 m (1.5 ft) above grade. The french drain is now (1997) covered by a metal caisson to protect it during construction of a nearby facility. (References: Carpenter and Cote 1994; DOE-RL 1994a, 1995a [Appendix K]; EPA 1996)	Soil, concrete	Undetermined organic and inorganic chemicals	$56,074
	100-K-29 (183-KE Sand-blasting Site)	Red garnet was used as sandblasting grit at this site to clean steel components from the 183-KE settling basins for painting. An area west of the 183-KE water treatment facility approximately 50 x 30 m (160 x 96 ft) is delineated by the presence of red garnet. (References: Carpenter and Cote 1994, DOE-RL 1994a)	Soil, red garnet sandblast grit	Undetermined organic and inorganic chemicals	$70,906
	100-K-30 (183-KE Sulfuric Acid Tank Site [West])	Site of a horizontal tank that was used for storage of sulfuric acid for water treatment. Unknown when removed. Concrete bases and aboveground piping for the tank remain in place. The site covers an area 10 x 3.7 m (33 x 12 ft). Depth and type of contamination (if any) is unknown. No information is available regarding disposal of sludge that the tank may have contained. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, concrete	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$59,382
	100-K-31 (183-KE Sulfuric Acid Tank Site [East])	Site of a horizontal tank that was used for storage of sulfuric acid for water treatment. Unknown when removed. Concrete bases and aboveground piping for the tank remain in place. The site covers an area 10 x 3.7 m (33 x 12 ft). Depth and type of contamination (if any) is unknown. No information is available regarding disposal of sludge that the tank may have contained. (References: Carpenter and Cote 1994, DOE-RL 1994a)	Soil, Concrete	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$59,182
	100-K-32 (183-KW Sulfuric Acid Tank Site [East])	Site of a horizontal tank that was used for storage of sulfuric acid for water treatment. Unknown when removed. Concrete bases and aboveground piping for the tank remain in place. The site covers an area 10 x 3.7 m (33 x 12 ft). Depth and type of contamination (if any) is unknown. No information is available regarding disposal of sludge that the tank may have contained. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, concrete	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$59,182
	100-K-33 (183-KW Sulfuric Acid Tank Site [West])	Site of a horizontal tank that was used for storage of sulfuric acid for water treatment. Unknown when removed. Concrete bases and aboveground piping for the tank remain in place. The site covers an area 10 x 3.7 m (33 x 12 ft). Depth and type of contamination (if any) is unknown. No information is available regarding disposal of sludge that the tank may have contained. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, concrete	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$59,382
	100-K-35 (183-KE Acid Neutralization Pit)	Received sulfuric acid tank transfer and overflow waste for neutralization before draining to the process sewer. The pit is a 2.5 x 2 x 1.5 m (8.3 x 6.3 x 5 ft) deep brick-lined concrete box located adjacent to the west outside wall of the 183-KE water treatment plant building and just north of the chlorine storage building. (References: Carpenter and Cote 1994, DOE-RL 1994a)	Concrete, brick	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$50,793

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-KR-2 (cont.)	100-K-36 (1706-KE Chemical Storage Facility Dry Well)	Received spillage from transfer of sodium hydroxide and sulfuric acid at the 1706-KE Chemical Storage Facility. The French drain consists of a 0.5 m (18 in) diameter, 1.2 m (4 ft) long vitrified clay pipe. A white crystalline material, believed to be sodium carbonate, can be seen on the drain, which is located east of the 1706-KE Building (References: Carpenter and Cote 1994, DOE-RL 1994a)	Soil, vitrified clay pipe	Undetermined organic and inorganic chemicals	$52,495
	100-K-46 (119-KE French Drain)	Received sample waste, janitorial waste, and drainage from the evaporative cooler for the 119-KE Sample Building. The 0.3 m (1 ft) diameter French drain was covered with crushed rock after removal of the 130 KE-1 Emergency Diesel Oil Storage Tank. Located about 8 m (24 ft) east of the 105-KE Reactor Building and 3 m (10 ft) south of the 119-KE Sample Building (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, vitrified clay pipe	Undetermined organic and inorganic chemicals; possible radionuclides	$61,657
	100-K-48[b] (100-KE Oil Contamination Areas)	Site of Bunker C fuel oil spillage from rail car off-loading procedures at the 130-KE-2 (166-KE) oil storage tank. The oil has been absorbed by soil and sand forming a hard asphalt-like covering on the surface.	Soil	Petroleum hydrocarbons; undetermined organic chemicals	$101,919
	100-K-49[b] (100-KW Oil Contamination Areas)	Site of Bunker C fuel oil spillage from rail car off-loading procedures at the 130-KW-2 (166-KW) oil storage tank. The oil has been absorbed by soil and sand forming a hard asphalt-like covering on the surface.	Soil	Petroleum hydrocarbons; undetermined organic chemicals	$101,919
	120-KE-3 (183-KE Filter Water Facility Trench, 100-KE-3)	Received sulfuric acid sludge from sulfuric acid storage tanks; sludge contained mercury. The sludge has been removed. The trench was 12.2 m (40 ft) long by 0.9 m (3 ft) wide and 0.9 m (3 ft) deep and lined with sand to allow the sludge water slurry to drain. Operated 1955-1970. (References: Carpenter and Cote 1994, DOE-RL 1994a, 1995a [Appendix K], EPA 1996)	Soil	As, Ba, Cd, Cr, Pb, Hg, Ag, Se, Sulfate	$43,477
	120-KE-6 (183-KE Sodium Dichromate Tank)	Site of a vertical steel tank 5.8 m (19 ft) in diameter that was used for storage of sodium dichromate solution for water treatment at 183-KE. Unknown when removed. Concrete base and piping for the tank remain in place. No known releases, but residual dichromate possible in soil from years of loading and handling. Operated 1955 to 1971. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, concrete	Cr	$50,793
	120-KW-5 (183-KW Sodium Dichromate Tank)	Site of a vertical steel tank 5.8 m (19 ft) in diameter that was used for storage of sodium dichromate solution for water treatment at 183-KW. Unknown when removed. Concrete base and piping for the tank remain in place. No known releases, but residual dichromate is possible in the soil because of years of loading and handling. Operated 1955 to 1971. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil, concrete	Cr	$50,793
	128-K-1 (100-K Burning Pit)	Used for burning and disposal of nonradioactive combustible waste such as chemical solvents, office and paint waste. Analogous to waste site 128-H-1. Dimensions are approximately 30 x 30 x 2.4 m deep (100 x 100 x 8 ft deep) (References: Carpenter and Cote 1994)	Soil, Debris	Organic Solvents; Petroleum Hydrocarbons	$65,601

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-KR-2 (cont.)	128-K-2 (100-K Construction Dump & Burning Pit)	Used for burning and disposal of nonradioactive waste. Scrap metal, glass, nonfriable and friable asbestos, and office, laboratory and paint waste are exposed. Dimensions are approximately 244 x 85 x 1.5 m deep (800 x 280 x 5 ft deep). (References: Carpenter and Cote 1994)	Soil, Debris	Organic Solvents; Petroleum Hydrocarbons	$120,098
	130-K-2[b] (1717-K Waste oil storage tank)	Site of a former underground tank that stored used motor oil. Tank was removed in July 1989. No evidence was found to indicate leakage from the tank, as reported in logbook WHC-N-270. Location is adjacent to the 1717-K Building. Operated 1955-1972. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil	Petroleum hydrocarbons; undetermined organic chemicals	$116,233
	130-KE-1 (105-KE Emergency Diesel Oil Storage Tank)	Site of two 7,571-L (2,000-gal) emergency diesel oil storage tanks that were removed in 1992. No evidence of leakage was found. However, insulating material covering the tank exteriors showed detectable radioactive contamination when removed. The contaminated insulating material was disposed with the tanks. Location is adjacent to the 105-KE Reactor ventilation stack. Operated 1955 to 1971. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil	Undetermined radionuclides	$66,539
	130-KW-1 (105-KW Emergency Diesel Oil Storage Tank)	Site of two 7,571-L (2,000-gal) emergency diesel oil storage tanks that were removed in 1992. No evidence of leakage was found. However, radioactive contamination was discovered on the exterior of the tanks. The tanks were disposed as contaminated. The site was cleaned and closed under the Underground Storage Tank Program (no radioactivity was left at the site). Location is adjacent to the 105-KW Reactor ventilation stack. Operated 1955 to 1970. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil	Undetermined radionuclides	$66,539
	600-29 (100-K Construction Laydown Area)	46-acre site used as the laydown area for the construction of 105-KE Reactor during 1952-1954. Site contains surface chemical dumping areas with oil-stained soil and distressed vegetation.. (Reference: Carpenter and Cote 1994)	Soil	Undetermined organic chemicals	$257,522
	UPR-100-K-1 (105-KE Fuel Storage Basin Leak)	Received water leaking from cracks in the 105-KE Reactor Fuel Storage Basin. The water is contaminated with radionuclides from accumulated sludge and leaking fuel elements in the Fuel Storage Basin. (References: Carpenter and Cote 1994, DOE-RL 1994a, EPA 1996)	Soil	H-3, C-14, Co-60, Sr-90, Cs-137, Eu-152, Eu-154, U-235, U-238, Pu-238, Pu-239/240	$74,341
100-IU-2 (CERCLA site – EPA lead)	600-3[b] (Waste Oil Dump, Asphalt Heliport)	The site is a circular area of heavy oil or asphalt about 4.6 m (15 ft) in diameter, and a ditch covered with similar material about 7.6 m (25 ft) long, 37 cm (15 in.) wide, and 2.5 cm (1 in.) deep. A 10-cm- (4-in.) diameter pipe is in the center of the pad and flush with the surface. Homestead type trash is scattered in the area. (References: Carpenter 1995, DOE-RL 1996)	Soil	Petroleum hydrocarbons; undetermined organic chemicals	$52,940
	600-52 (White Bluffs Surface Basin)	This site is a depression, 85 by 40 m (280 by 130 ft), adjacent to the pickling acid crib. Material in the crib may have washed into the depression, although previous sampling in the depression for the pickling acid crib ERA showed no contaminants at levels of concern. The depression may have also been used as a surface drain field for the White Bluffs Ice House. Some demolition debris is in the area. (References: Carpenter 1995; DOE-RL 1996, 1993e)	Soil	Cr, Zn	$81,274

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-IU-2 (cont.)	600-98 (East White Bluffs City Landfill (EWBCL))	Pre-Hanford municipal landfill covered with clean fill. Dimensions are approximately 98 x 61 x 3 m deep (320 x 200 x 10 ft deep).	Soil, Debris	Probable Pesticides and Organic Solvents	$96,591
	600-99 (J.A. Jones #2)	The site contained minor construction debris used by the J.A. Jones construction company, including wood, concrete, and metals. The site was exhumed and contents taken to a 200 Area burial ground in 1971. The dimensions are 9.1 x 9.1 m (30 x 30 ft). (References: Carpenter 1995, DOE-RL 1996)	Soil	Undetermined organic and inorganic chemicals	$55,087
	600-100 (White Bluffs Landfill, alias 600-119)	Pre-Hanford municipal landfill covered with clean fill. Dimensions are approximately 38 x 15 x 3 m deep (125 x 50 x 10 ft deep).	Soil, Debris	Probable Pesticides and Organic Solvents	$55,087
	600-120 (Spare Parts Burn Pit)	The site is a burn pit that was used for industrial and commercial wastes, and has been backfilled with coal ash. Dimensions unknown. (References: Carpenter 1995, DOE-RL 1996)	Ash, soil	Undetermined organic and inorganic chemicals	$112,225
	600-124 (Burn Site and Paint Disposal Area)	The area is littered with debris, such as burned wood, roofing materials, glass, nails, chips of dried paint, and paint cans. (References: Carpenter 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic and inorganic chemicals	$126,540
	600-125 (Waste Disposal Trench 1)	Pre-Hanford landfill trench covered with clean fill. Dimensions are approximately 30 x 7.6 x 3 m deep (100 x 25 x 10 ft deep) (Reference: Carpenter 1995)	Soil, Debris	Probable Pesticides and Organic Solvents	$55,087
	600-127[b] (Fuel Storage Area)	A low soil berm ~ 55 x 35 m (182 x 116 ft) surrounds two loading docks. The soil is covered by a layer of coal ash. Fuel storage tanks may have been held in this area. The soil under the coal ash and adjacent to the berm is discolored, probably from petroleum contamination (oils and gasoline). (References: Carpenter 1995, DOE-RL 1996)	Soil, ash	Petroleum hydrocarbons; Undetermined organic chemicals	$68,766
	600-128[b] (Oil and Oil Filter Dump Site)	The site, about 2 m (6.6 ft) in diameter, contains oil and oil filters. (References: Carpenter 1995, DOE-RL 1996)	Soil	Petroleum hydrocarbons; Undetermined organic chemicals	$52,940
	600-129 (White Bluffs Dump Site)	Pre-Hanford landfill and community dump site. Dimensions are approximately 201 x 152 x 3 m (660 x 500 x 10 ft deep) (Reference: Carpenter 1995)	Soil, Debris	Probable Pesticides and Organic Solvents	$127,685
	600-131 (Special Fabrication Shop and Warehouse)	The site is the remnants of a fabrication shop, boilerhouse, warehouse, loading dock/well, and water station. The area is graveled and littered with debris. Solvents and oils were typically used in similar facilities. (References: Carpenter 1995, DOE-RL 1996)	Concrete, soil, transite, miscellaneous debris	Undetermined organic and inorganic chemicals	$116,233

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-IU-2 (cont.)	600-132 (Construction Contractor Shop Landfill)	This site is a large (~165 x 112 m [545 x 370 ft]) open pit landfill that was contaminated and cleaned out. A notation in an old logbook suggests a potential for radioactive wastes (source unknown), but it is unknown if additional characterization work was done. Another employee reported that the site was used for disposal of oils and solvents. (References: Carpenter 1995, DOE-RL 1996)	Soil	Undetermined radionuclides, inorganic and organic chemicals	$145,983
	600-139[b] (Automotive Repair Shop)	The site has scattered debris, such as battery caps, gaskets, oil stains, and lenses from tail lights. Dimensions are about 30 x 20 m (100 x 66 ft). (References: Carpenter 1995, DOE-RL 1996)	Soil, miscellaneous debris	Petroleum hydrocarbons; Undetermined organic chemicals	$55,087
	600-176 (White Bluffs Paint Disposal Area)	Excess paint materials were disposed of by dumping them on the ground. Dried paint chips remain at the site. (References: Carpenter 1995, DOE-RL 1996)	Soil, paint chips	Undetermined organic chemicals	$116,233
	600-181[b] (White Bluffs Oil Dump)	A large quantity of oils have been dumped on the surface in an area about 17 x 15 m (56 x 50 ft). (References: Carpenter 1995, DOE-RL 1996)	Soil	Petroleum hydrocarbons; Undetermined organic chemicals	$52,940
	600-188 (White Bluffs Waste Disposal Trench 2)	The site is an open trench with industrial wastes filling about one-third of the trench. Empty 208-L (55-gal) drums and discolored soil remain in the 90 x 40 m (300 x 132 ft) site. (References: Carpenter 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic and inorganic chemicals	$84,679
	600-190 (White Bluffs Warehouse Tar/ Paint Disposal Area)	Tar and paints appear to have been dumped at the site. The site also contains warehouse sites and associated french drains, concrete foundations, valve boxes, and miscellaneous debris. (References: Carpenter 1995, DOE-RL 1996)	Soil, concrete, debris	Undetermined organic chemicals	$116,233
	600-201 (White Bluffs Paint and Solid Waste Disposal Site)	The site contains miscellaneous debris such as glass, metal shavings, canvas, and dried paint. (References: Carpenter 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic chemicals	$116,233
	628-1 (White Bluffs Burn Pit)	Approximately 1/4 acre has stressed vegetation. The burn pit is covered with sand and gravel. (References: Carpenter 1995, DOE-RL 1996)	Soil	Undetermined organic chemicals	$62,738
100-IU-6 (CERCLA site - EPA lead)	600-3 (Hanford Townsite Dumping Area and Paint Pit)	The site is an old borrow pit, and a large (~490 x 280 m [1,600 x 925 ft]) area of scattered trash. Bulldozer tracks indicate an attempt to bury trash. Parts of the area show signs of burning and stressed vegetation. The site may have been used as railroad maintenance shop disposal yard. (References: Deford 1995, DOE-RL 1996)	Soil, asbestos miscellaneous debris	Undetermined organic and inorganic chemicals	$220,303

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-IU-2 (cont.)	600-98 (East White Bluffs City Landfill [EWBCL])	Pre-Hanford municipal landfill covered with clean fill. Dimensions are approximately 98 x 61 x 3 m deep (320 x 200 x 10 ft deep).	Soil, Debris	Probable Pesticides and Organic Solvents	$96,591
	600-99 (J.A. Jones #2)	The site contained minor construction debris used by the J.A. Jones construction company, including wood, concrete, and metals. The site was exhumed and contents taken to a 200 Area burial ground in 1971. The dimensions are 9.1 x 9.1 m (30 x 30 ft). (References: Carpenter 1995, DOE-RL 1996)	Soil	Undetermined organic and inorganic chemicals	$55,087
	600-100 (White Bluffs Landfill; alias 600-119)	Pre-Hanford municipal landfill covered with clean fill. Dimensions are approximately 38 x 15 x 3 m deep (125 x 50 x 10 ft deep).	Soil, Debris	Probable Pesticides and Organic Solvents	$55,087
	600-120 (Spare Parts Burn Pit)	The site is a burn pit that was used for industrial and commercial wastes, and has been backfilled with coal ash. Dimensions unknown. (References: Carpenter 1995, DOE-RL 1996)	Ash, soil	Undetermined organic and inorganic chemicals	$112,225
	600-124 (Burn Site and Paint Disposal Area)	The area is littered with debris, such as burned wood, roofing materials, glass, nails, chips of dried paint, and paint cans. (References: Carpenter 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic and inorganic chemicals	$126,540
	600-125 (Waste Disposal Trench 1)	Pre-Hanford landfill trench covered with clean fill. Dimensions are approximately 30 x 7.6 x 3 m deep (100 x 25 x 10 ft deep) (Reference: Carpenter 1995)	Soil, Debris	Probable Pesticides and Organic Solvents	$55,087
	600-127[b] (Fuel Storage Area)	A low soil berm ~ 55 x 35 m (182 x 116 ft) surrounds two loading docks. The soil is covered by a layer of coal ash. Fuel storage tanks may have been held in this area. The soil under the coal ash and adjacent to the berm is discolored, probably from petroleum contamination (oils and gasoline). (References: Carpenter 1995, DOE-RL 1996)	Soil, ash	Petroleum hydrocarbons; Undetermined organic chemicals	$68,766
	600-128[b] (Oil and Oil Filter Dump Site)	The site, about 2 m (6.6 ft) in diameter, contains oil and oil filters. (References: Carpenter 1995, DOE-RL 1996)	Soil	Petroleum hydrocarbons; Undetermined organic chemicals	$52,940
	600-129 (White Bluffs Dump Site)	Pre-Hanford landfill and community dump site. Dimensions are approximately 201 x 152 x 3 m (660 x 500 x 10 ft deep) (Reference: Carpenter 1995)	Soil, Debris	Probable Pesticides and Organic Solvents	$127,685
	600-131 (Special Fabrication Shop and Warehouse)	The site is the remnants of a fabrication shop, boilerhouse, warehouse, loading dock/well, and water station. The area is graveled and littered with debris. Solvents and oils were typically used in similar facilities. (References: Carpenter 1995, DOE-RL 1996)	Concrete, soil, transite, miscellaneous debris	Undetermined organic and inorganic chemicals	$116,233

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-IU-6 (cont.)	UPR-600-16 (Fire and Contamination Spread)	A fire during decontamination of the P-11 Facility for plutonium criticality studies spread plutonium contamination throughout the facility. In 1974 the site was decontaminated, demolished and released from radiation zone status. The dimensions provided are 55 x 30.5 m (180 x 100 ft) (References: Deford 1995, DOE-RL 1996)	Soil	Plutonium	$69,188
200-CW-3 (CERCLA site EPA lead)	216-N-1[c] Cooling Water Pond	Received cooling water from 212-N Building fuel storage basins. Site dimensions are approximately 152 x 30 x 1.8 m deep (500 x 100 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$49,203
	216-N-2[c] Cooling Water Trench	Received basin water and sludge when the 212-N Building fuel storage basins were drained for special tests in 1947. Site dimensions are approximately 15 x 3 x 2.1 m deep (50 x 10 x 7 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$49,203
	216-N-3[c] Cooling Water Trench	Received sludge and residual water from cleanout of 212-N Building fuel storage basins when operations ceased in 1952. Site dimensions are approximately 15 x 6.1 x 1.8 m deep (50 x 20 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$49,203
	216-N-4[c] Cooling Water Pond	Received cooling water from 212-P Building fuel storage basins. Site dimensions are approximately 152 x 61 x 1.8 m deep (500 x 200 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$82,388
	216-N-5[c] Cooling Water Trench	Received sludge and residual water from cleanout of 212-P Building fuel storage basins when operations ceased in 1952. Site dimensions are approximately 24 x 4.6 x 1.8 m deep (80 x 15 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$49,203
	216-N-6[c] Cooling Water Pond	Received cooling water from 212-R Building fuel storage basins. Site dimensions are approximately 152 x 46 x 1.8 m deep (500 x 150 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$69,188

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
100-IU-6 (cont.)	600-107 (Cribs at 213-J&K Gable Mtn Plutonium Storage Vaults)	Two small (2.4 m [8 ft] diameter, 4.6 m [15 ft] deep) gravel filled concrete culverts on either side of the 213-J and K storage vaults were dug up in 1974 to allow a radiological survey. No contamination was found above background limits, and the excavated material was backfilled. (References: Deford 1995, DOE-RL 1996)	Concrete, soil	Undetermined radionuclides	$51,350
	600-108[a] (213-J and K Gable Mtn Plutonium Storage Vaults)	The reinforced concrete facility was constructed into the side of Gable Mountain. The vaults are used for soil sample storage and seismic testing. The unit is 12.2 x 3.7 x 2.4 m deep (40 x 12 x 8 ft deep). If the vaults were used to store plutonium at all, it is thought to have been only briefly. However, explosives and hardware contaminated with radioactive sodium were stored there. No smearable radioactivity was detected, and the site has been released from radiation zone status. (References: Deford 1995, DOE-RL 1996)	Concrete	Undetermined radionuclides	$55,803
	600-109 (Hanford Trailer Camp Landfill [HTCL])	Domestic landfill for residences of Hanford Site construction workers. No hazardous materials known. Dimensions are approximately 30 x 30 x 2.4 m deep (100 x 100 x 8 ft deep).	Soil, Debris	Probable Pesticides and Organic Solvents	$65,601
	600-110 (Hanford Townsite Landfill [HTL])	Pre-Hanford municipal landfill for the Hanford townsite. No hazardous materials known. Dimensions are approximately 61 x 61 x 3 m deep (200 x 200 x 10 ft deep)	Soil, Debris	Probable Pesticides and Organic Solvents	$82,818
	600-111 (P-11 Critical Mass Laboratory)	The 2.4 x 2.4 m (8 x 8 ft) facility had concrete walls, cover, and base. It was retired in 1951 after a fire in the adjacent 120 Building caused structural damage. The facility was exhumed in 1974. It had received plutonium waste from the 120 Building. A 3.7-m (12-ft) steel pipe rising from a concrete slab remains at the site. (References: Deford 1995, DOE-RL 1996)	Concrete, soil	Undetermined radionuclides	$57,950
	600-202 (Four Burn and Burial Pits)	Four burn and burial pits are arranged in a rectangle, 150 x 75 x 6 to 12 m deep (500 x 250 x 20 to 40 ft deep). Miscellaneous debris, including glass, metal, and porcelain, are evident at the site. (References: Deford 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic chemicals	$179,942
	600-204 (Hanford Townsite Burn and Burial Trench)	The site was used as a burn pit and possibly burial ground. Miscellaneous debris (metal and glass fragments, fire-scarred rock, and cans) is scattered in the bottom. Site dimensions are approximately 45.8 x 6.1 x 1.2 m deep (150 x 20 x 4 ft deep). (References: Deford 1995, DOE-RL 1996)	Soil, miscellaneous debris	Undetermined organic chemicals	$55,087
	600-205 (Hanford Townsite Landfill 2)	Pre- Hanford municipal landfill for the Hanford townsite. No hazardous materials known. Dimensions are approximately 61 x 30 x 1.5 m deep (200 x 100 x 5 ft deep)	Soil, Debris	Probable Pesticides and Organic Solvents	$69,331
	600-208 (Hanford Construction Camp Boiler House Ponds)	These are liquid waste disposal ponds serving the steam plants for the Hanford Construction Camp. The wastes in the water would have been "industrial and commercial wastes common to the period," which was considered to be mostly water softener brine. The dimensions of the ponds are 18.3 x 6.1 x 1.5 m deep (60 x 20 x 5 ft deep). (References: Deford 1995, DOE-RL 1996)	Soil	Undetermined organic and inorganic chemicals	$43,477

Table A-2. Candidate 100 Area Remaining Sites for Plug-in of Remove/Treat/Dispose. (19 pages)

Operable Unit	Site Name	Current Site Knowledge	Media/ Material	Potential Contaminants	Estimated Cost of Sampling
200-CW-3 (cont.)	216-N-7[c] Cooling Water Trench	Received sludge and residual water from cleanout of 212-R Building fuel storage basins when operations ceased in 1952. Site dimensions are approximately 24 x 4.6 x 1.8 m deep (80 x 15 x 6 ft deep).	Soil	Co-60, Sr-90, Cs-137, Eu-155, U-238, Pu-239/240	$49,203
TOTAL: 161 Remaining Sites for Sampling					$12,288,024

NOTE: See 100 Area Source Operable Unit Focused Feasibility Study (DOE/RL-94-61), Appendix N, Section N5.0, for references cited throughout this table.

[a]This site is an active waste management unit where hazardous substances have been potentially released or a substantial threat of a release of a hazardous substance exists. While these units are currently in service in support of DOE project activities, they are planned to be taken out of service by DOE when the project mission for these units has been completed and addressed by the selected remedy specified in the 100 Area Remaining Sites Interim ROD.

[b]This site is a petroleum site that is being remediated to cleanup standards established in the Model Toxics Control Act Cleanup Regulations (WAC 173-340) and is outside the CERCLA remedy selection process. It is anticipated that this site can be remediated by the Remove, Treat, and Dispose Alternative. However, should petroleum be found at depth in the soil or in groundwater, other remedial alternatives may be selected by the EPA, Ecology, and the DOE.

[c]This site has been determined by the Tri-Parties to have had a process history most closely aligned with liquid waste disposal sites in the 100 Area. Therefore, these units are being addressed by CERCLA with 100 Area waste management units rather than with 200 Area units.

ARCL = Allowable Residual Contamination Level

Responsiveness Summary Overview

The Hanford Site was established in 1943 to produce plutonium for nuclear weapons. It is situated north and west of the cities of Richland, Kennewick, and Pasco. Land use in the areas surrounding the Hanford Site includes urban and industrial development, irrigated and dry-land farming, grazing, and designated wildlife refuges. Operations at the Hanford Site are currently focused on environmental cleanup and waste management.

The 100 Area, which encompasses approximately 68 km^2 (26 mi^2) bordering the south shore of the Columbia River, is the site of the nine retired plutonium production reactors. The waste sites being considered for remediation in this ROD are in the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-1-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable U- nits. The 100-IU-2 and 100-IU-6 Operable Units are the former locations of temporary housing and support facilities for the Manhattan Project, and include the former town sites of White Bluffs and Hanford. Because of their process history, the Tri-Parties have determined that the waste sites of the 200-CW-3 waste site group are most closely aligned with liquid waste disposal sites in the 100 Area and will therefore be considered part of the Remaining Sites. These waste sites received cooling water and sludge from 100 Area reactor operations. The remainder of the above operable units include waste sites around the 100 Area production reactors where liquid and solid radioactive wastes and industrial chemicals were disposed to the soil.

Cleanup of waste sites in the 100 Area began in 1995. To date, over 1,000,000 tons of contaminated soil has been removed and transported to the Environmental Restoration Disposal Facility in the Hanford 200 Area. Cleanup of 100 Area waste sites is anticipated to be complete by approximately the year 2011. The wastes sites listed in the this ROD will be incorporated into the integrated 100 Area cleanup schedule.

II. Background on Community Involvement and Concerns

The public has been involved in the cleanup of Hanford since the *Hanford Federal Facility Agreement and Consent Order* was signed in 1989. Since 1989 a number of stakeholder work groups and task forces have been used to enhance decision making at the Hanford Site. In January 1994 the Hanford Advisory Board was formed to provide informed advice to DOE, EPA and the Washington State Department of Ecology. To date, the board has issued over ninety pieces of advice, several of which directly relate to 100 Area cleanup.

A consistent message from interested citizens and affected Indian Nations is to get on with cleanup and protect the Columbia River.

III. Summary of Major Questions and Comments Received During the Public Comment Period and the Agency Response to Those Comments

Comments received during the public comment period are presented in this section. Responses to the comments follow each comment. Copies of all comment letters and EPA's response are located in the Administrative Record.

Comment:

Additional detail should be provided about the effects of the Remove/Treat/Dispose fill material on the movement of contaminants remaining below the excavation level. Will this fill material significantly increase the rate at which recharge water, or other fluids, move through the vadose zone and therefore increase the rate of movement of contaminants?

Response:

The majority of the backfill material is located in the general vicinity of the reactor areas. The fill material has similiar geo-physical characteristics as the waste material being removed. In addition, all waste sites will be revegatated and this will reduce the rate of infiltration.

Comment:

A formal process is needed for evaluating a sites suitability for the plug-in approach. This process should include evaluation criteria and evaluation methodologies and provisions for public review and comment on the final decision as a minimum.

Response:

The 161 sites proposed have been screened and initial information indicate they do meet the criteria outlined in the proposed plan for Remove/Treat/Dispose. If during detailed design or during actual cleanup a site is found to be outside the Remove/Treat/Dispose alternative an explanation of significant difference or a ROD amendment would be required and would include public review and comment.

Comment:

The preferred interim remedial alternatives section discusses storing waste if it is impractical to treat to meet ERDF acceptance criteria. Include in the discussion the options being considered for this storage.

Response:

It is the intent of the Tri-Parties not to store this waste, however, if storage is required it will either occur at the waste site, ERDF, Central Waste Complex or other appropriate storage location.

Comment:

Any cleanup alternative requiring disposal on the 200 Area plateau should be deferred until issues raised in the General Accounting Office audit report entitled Nuclear Waste: Understanding Waste Migration at Hanford is Inadequate for Key Decisions are addressed.

Response:

EPA has reviewed the GAO report and it is our impression that the report focuses on the U.S. Department of Energy tank farms and the lack of solid vadose information in this program. The waste from the 100 Area waste sites will be placed in a state of the art disposal facility that has been built to comply with all current environmental laws.